DOCUMENT RESUME

ED 251 312 SE 045 265

TITLE	UNESCO Science Programs: Impacts of U.S. Withdrawal and Suggestions for Alternative Interim Arrangements. A Preliminary Assessment.
INSTITUTION	National Academy of Sciences - National Research Council, Washington, DC. Office of International Affairs.
SPONS AGENCY	Department of State, Washington, DC. Bureau of International Organization Affairs.
PUB DATE	84
CONTRACT	DOS-1021-410172
NOTE	146p.
PUB TYPE	Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01/PC06 Plus Postage.
DESCRIPTORS	Engineering; Environmental Education; Financial Support; *International Programs; Natural Resources; Oceanography; *Physical Environment; Program Development; *Program Evaluation; Program Implementation; *Science Programs; *Sciences; *Scientific Research; Technology
IDENTIFIERS	Man and the Biosphere; *UNESCO

ABSTRACT

This study was conducted to provide the U.S. Department of State with an assessment of the potential impacts on science of a United States withdrawal from UNESCO and to suggest possible alternative arrangements to maintain essential U.S. scientific contacts with UNESCO-sponsored programs in case the United States were no longer a member of UNESCO on January 1, 1985. Following an introduction (chapter 1), the strategic considerations that provide the basis for the study (including significant caveats and limitations that pertain to the findings) are discussed in chapter 2. A summary of preliminary findings is presented in chapter 3. A program assessment (including potential impacts of a U.S. withdrawal), suggested alternatives, a summary of preliminary findings, and budgetary information is provided in chapter 4 for these three UNESCO Major Programs and subprograms: (1) Sciences and Their Application to Development (Natural Sciences, Technology and Engineering, Key Areas, Social and Human Services, Key Areas); (2) Science, Technology and Society-STS (Relations and STS Policies); and (3) The Human Environment and Terrestrial and Marine Resources (Earth Sciences and Resources, Natural Hazards, Water Resources, Oceans and Resources, Coastal and Island Regions, and Environmental Sciences: Man and the Biosphere). A supplement providing detailed information on program areas within the UNESCO Major Programs is included. (JN)

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UNESCO SCIENCE PROGRAMS

Impacts of U.S. Withdrawal and Suggestions for Alternative Interim Arrangements

A Preliminary Assessment

NRC NAS NAE IOM

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UNESCO SCIENCE PROGRAMS:

IMPACTS OF U.S. WITHDRAWAL AND

SUGGESTIONS FOR ALTERNATIVE INTERIM ARRANGEMENTS

A Preliminary Assessment

Office of International Affairs
National Research Council

National Academy Press
Washington, D.C. 1984

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

This report has been reviewed by a group other than the authors according to procedures approved by the Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

The National Research Council was established by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and of advising the federal government. The Council operates in accordance with general policies determined by the Academy under the authority of its congressional charter of 1863, which establishes the Academy as a private, nonprofit, self-governing membership corporation. The Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in the conduct of their services to the government, the public, and the scientific and engineering communities. It is administered jointly by both Academies and the Institute of Medicine. The National Academy of Engineering and the Institute of Medicine were established in 1964 and 1970, respectively, under the charter of the National Academy of Sciences.

This report has been prepared by the Office of International Affairs, National Research Council, for the Office of Communications and UNESCO Affairs, Bureau of International Organizations, U.S. Department of State, under Contract DOS 1021-410172.

PREFACE

In reply to a letter from the Chairman of the House Committee on Foreign Affairs requesting views on the announced U.S. withdrawal from UNESCO (scheduled to take place on December 31, 1984), the President of the National Academy of Sciences stated that "the Governing Board of the National Research Council and the Council of the National Academy of Sciences are deeply concerned about the potential impacts on science of a withdrawal by the United States from UNESCO." Withdrawal will have significant implications for global science programs in which U.S. scientists are deeply involved, often in a leadership role. Therefore, the Academy, through the Office of International Affairs (OIA) of the National Research Council (NRC), agreed to respond to an invitation to provide the U.S. Department of State with an assessment of potential impacts and to suggest possible alternative arrangements in order to maintain essential U.S. scientific contacts with UNESCO-sponsored programs in case the U.S. were no longer a member of UNESCO on January 1, 1985.

The strategic considerations that provide the basis for the study, including significant caveats and limitations that pertain to the findings, are discussed in Chapter 2. An important summary of general preliminary findings will be found in Chapter 3. The assessments and proposed interim arrangements for specific programs and subprograms within the three major science program sections of the UNESCO Approved Programme and Budget for 1984-85 are further detailed in Chapter 4.

Constraints of time and money, in addition to limited analytical background material, seriously influenced the scope of the study. Normal NRC procedures, which typically include a specially appointed study committee, proved impossible in this instance. We did, however, avail ourselves of a well-balanced ad hoc group, and the present report has been reviewed by several distinguished members of the scientific community. The detailed analysis of the UNESCO program and budget was conducted by a consultant, Dr. Philip Hemily, and the OIA staff. This examination was augmented by interviews with U.S. scientists engaged in, or familiar with, the science activities of UNESCO.

U.S. budgetary cycles make it imperative to convey some preliminary findings now since preparation of funding recommendations is under way. It is clear, however, that a much more detailed and critical analysis of the science programs of UNESCO and of other intergovernmental organizations is badly needed. The present study is dedicated to the hope that such a broad-gauged review will be implemented.

Walter A. Rosenblith
Foreign Secretary
National Academy of Sciences

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Chapter 1

INTRODUCTION

> The United Nations Educational, Scientific, and Cultural Organization (UNESCO) was founded in 1946 "for the purpose of advancing, through the educational and scientific and cultural relations of the peoples of the world, the objectives of international peace and of the common welfare of mankind. . ."

The announced U.S. intention to withdraw from membership in UNESCO at the end of 1984 has prompted concern within the scientific community, both national and international, about the consequences for global science cooperation. Problems of the earth, oceans, atmosphere, environment and the cosmos require the collaboration of scientists on a worldwide scale. Although science represents only a part of the total UNESCO mandate, and about one-third of the budget, it is a significant element that historically has facilitated important contributions to the spirit of international cooperation and to the advancement and health of the scientific enterprise. UNESCO is one of many international institutions for science cooperation that have developed in the post-World War II era and is unique in the breadth of its concerns, giving testimony to the important linkages between education, science and culture. Although official U.S. withdrawal from this forum has implications for all the programs of UNESCO, this report focuses only on the science programs. The prospect of U.S. nonmembership in UNESCO raises questions about the immediate implications for ongoing collaborative programs in which the United States is an active participant as well as for the long-term future of U.S. involvement in international science activities.

As a private institution, the National Academy of Sciences is not a formal participant in UNESCO, an intergovernmental organization. However, because of the involvement of the U.S. scientific community in many UNESCO-sponsored science activities, the Council of the NAS and the Governing Board of the National Research Council have expressed concern regarding the impacts on science of a U.S. withdrawal from UNESCO.[1] In March, the Academy, through its National Research Council, offered to assist the Department of State in assessing the impacts on some of the major science programs and to suggest possible

alternative arrangements whereby essential U.S. scientific collaborations could be maintained. It is important to note that the issue posed was not whether the United States should or should not withdraw from UNESCO. The Academy had already expressed the view that, on balance, U.S. science gains more than it loses from participation in UNESCO science programs. This report, therefore, makes no statement on the fundamental question of withdrawal. The present approach is one of helping to minimize the costs of a decision that was made, not on the basis of scientific considerations, but on a range of other, largely political, factors. Also, although it is recognized that UNESCO as an institution could benefit from some reform, particularly at the management level, this report does not, to any significant degree, deal with that issue.

The growth and diversification of science and the rapid expansion in the number of participants in international activities has created a tremendously complex situation that is straining the capabilities of international institutions for cooperation. In the science area there is a vast array of organizations, intergovernmental and nongovernmental, dedicated to the promotion of international cooperation . In large part, this stems from the universality of the scientific enterprise itself and the need to share and confirm research findings world wide, an inherent feature of scientific progress and global cooperation. The development of the UN system of specialized agencies has been an important complement to the many nongovernmental organizations that have emerged within individual professional communities. UNESCO, in particular, has fostered contacts and interactions with such organizations, most notably in the science area, with the International Council of Scientific Unions (ICSU) and its individual disciplinary unions.[2] It is possible, therefore, to begin to identify a number of potential alternative organizations based largely on existing patterns of cooperation with UNESCO as a <u>partial</u> response to the problem. However, as will be amplified in the following chapter on strategic considerations, there has not been either time or resources in this study to consult with these organizations to determine their capability and/or willingness to serve in this capacity. This has to be a major concern, in terms of the viability of the proposed alternatives. Since the time frame of the present report relates primarily to FY-86, other alternative options that are outlined feature support to UNESCO for specific activities, particularly for the major intergovernmental programs, and increased resources to national agencies to be utilized for facilitating U.S. participation in UNESCO programs within their areas of competence.

The present study emphasizes the need to inquire more deeply into the objectives, consequences, and benefits of U.S. participation in intergovernmental science programs and relationships between intergovernmental and nongovernmental organizations. The absence of an overall strategic policy framework for U.S. participation in international science is a severe handicap. There is a need to clarify the various means of intergovernmental scientific and technological cooperation and to reach common understandings on the most imaginative, productive ways of utilizing our intellectual and financial resources. This is an important issue not only for the United States, but also for

other countries which will be affected by U.S. withdrawal. The U.S. inclination to utilize alternative forums also has implications for the overall funding of international science that need to be viewed in a larger policy context than just UNESCO. New models for international science cooperation may be required to meet contemporary needs both for advancing science and for strengthening infrastructures in developing countries.

Questions are being posed with regard to the value of specific areas of UNESCO-sponsored programs to the U.S. scientific community: How well does UNESCO carry out these programs? Are the programs that are directed primarily toward the needs of developing countries adequately designed and implemented? Is UNESCO the most effective organization for carrying out these programs? If so, is there sufficient guidance and participation from the worldwide science and technology community to ensure effective and efficient program implementation? What measures might be taken to improve the performance of UNESCO? What might be the loss to our scientific community, as well as to those of other countries, if the United States withdraws fom UNESCO on December 31, 1984? Coupled with this last question is the significance of the contributions of the American scientific community to UNESCO. It is some of these questions that the following assessment attempts to address.

REFERENCES

1. Letter from Dr. Frank Press to Congressman Dante Fascell, April 17, 1984.

2. The International Council of Scientific Unions (ICSU) represents the principal nongovernmental mechanism created by scientists to advance scientific interests on an international basis. The structure of ICSU is based on dual membership, encompassing 20 disciplinary scientific unions and 70 national members. The national members are usually academies or national research councils. In the United States, the National Academy of Sciences is the adhering body to ICSU as well as individually to 17 of the member unions. ICSU and the unions, with a combined annual budgetary level of $5 million, provide an important framework for the orderly handling of international, nongovernmental scientific cooperation.

Chapter 2

STRATEGIC CONSIDERATIONS

THE U.S. DECISION TO WITHDRAW FROM UNESCO

The Secretary of State notified the Director General of UNESCO on December 29, 1983, that the United States would withdraw from UNESCO on December 31, 1984. This letter of notification charged that UNESCO had "extraneously politicized virtually every subject it deals with; exhibits hostility toward the basic institutions of a free society, especially a free market and a free press; and demonstrated unrestrained budgetary expansion."[1]

Assistant to the President for National Security Robert C. McFarlane noted, in a memorandum of December 23, 1983, to the Secretary of State, the President's approval of notification of withdrawal, but also his desire to promote meaningful changes in UNESCO during 1984.[2] A second memorandum of February 11, 1984, from McFarlane proposed a strategy including an action plan and the mobilization of international support to assist the effort to promote changes in UNESCO during 1984.[3]

A U.S. Monitoring Panel, comprising 15 eminent citizens knowledgeable in UNESCO's various areas of activity, was established in March 1984. It was instructed to report to the Secretary of State near the end of 1984 on the degree and kinds of change that might have occurred in UNESCO in the interim, with a view to assisting the Secretary in determining whether to recommend revision of the decision to withdraw.[4]

Nonetheless, the State Department has stressed the fact that its decision to withdraw is firm. Barring unforeseen changes and developments, it is assumed that the United States will no longer be a member of UNESCO as of January 1, 1985. The Administration has also stressed that the United States would continue to participate in programs that meet the original goals of UNESCO and thereby "pursue international cooperation in education, science, culture, and communications by shifting our contribution to other appropriate bilateral, multilateral, or private institutions."[5] It should be noted, with reference to pursuing UNESCO types of international cooperative activities through other channels, that the current level of total U.S. mandatory contributions to UNESCO is on the order of $50 million per year, with science activities funded at about $14 million per year.

During the period preceding the December 1983 announcement of the decision to withdraw, a wide-ranging review of UNESCO activities was carried out under the auspices of the Department of State. This review drew on the views of a number of U.S. public and private institutions

which benefited from, participated in, or contributed to UNESCO activities in education, science, culture, and communications. The objective was to produce, in light of the information gathered, an analysis of overall political and management trends in the Organization.[6] Some 12 U.S. government agencies contributed to this US/UNESCO Policy Review from their special perspectives, as did the U.S. National Commission for UNESCO and the National Academy of Sciences. The organizations concerned with science programs reached the conclusion that the United States should continue its participation in UNESCO.[7]

However, the State Department's own analysis of political and management trends provided the basis inter alia for the decision to recommend U.S. withdrawal.

At the same time, the Department's US/UNESCO Policy Review stated that "UNESCO science activities generally satisfy U.S. objectives and priorities." It went on to note five consequences of withdrawal:

- U.S. withdrawal from UNESCO science activities, if not compensated by alternative forms of cooperation, could lead to a significant reduction in the direct access of the U.S. scientific community to important data bases, localities, and scientific resources worldwide.

- The decrease in income from dues would damage UNESCO's ability to meet the U.S. objective of assistance to LDCs (less developed countries) in developing scientific capabilities and infrastructure, and to perform the successful international scientific projects which UNESCO has sponsored.

- The United States would lose its present access to an important international framework for scientific cooperation and data gathering.

- UNESCO provides the possibility of scientific exchange with certain countries with whom we maintain limited contact. Withdrawal would make such cooperation more difficult.

- The United States would no longer be eligible for membership on the International Coordinating Council of the Program on Man and the Biosphere, the Coordinating Council of the International Hydrological Program, and the Intergovernmental Council for the General Information Program.[6]

Given these consequences, it is necessary to explore alternative ways of pursuing U.S. objectives of international cooperation and collaboration in the science area. As a partial contribution to the effort, this report presents assessments of the impact on U.S. science of a withdrawal from UNESCO and suggests possible alternative arrangements for assuring continued U.S. association with selected UNESCO programs.

STRATEGY FOR THE SCIENCE ASSESSMENT

The genesis of the task of assessment undertaken by the National Research Council can be briefly summarized. In October 1983, when consultations were in progress on contributions to the US/UNESCO Policy Review, noted above, the Foreign Secretary of the National Academy of Sciences provided the Assistant Secretary of State for International Organizational Affairs (at his request) with some initial views pertaining to the quality and management of UNESCO science activities. In particular, he noted:

- Science-related programs represent, in many ways, UNESCO's most successful effort and fulfill an important function for the U.S. in terms of international science cooperation and science education.

- There is much criticism leveled at UNESCO programs, structure and management, but, in the area of the sciences at least there is no real alternative to UNESCO at the present time.

- With respect to the management of UNESCO science programs, there is certainly room for improvement.

- The mechanisms necessary to ensure effective U.S. participation in UNESCO are not currently available.[8]

Following the announcement of the intention to withdraw from UNESCO, a number of bodies of the Academy complex considered the implications of withdrawal with respect to U.S. science interests and its impact on science in general. This process resulted in the letter of March 13, 1984, from the Foreign Secretary of the National Academy of Sciences to the Assistant Secretary of State for International Organizational Affairs offering assistance in assessing the impacts of the U.S. withdrawal in the science area and in identifying possible alternative arrangements for U.S. participation.[9] This initiative provided the basis for the contract between the Department of State and the National Academy of Sciences to prepare the following:

- An inventory of existing UNESCO-sponsored programs and arrangements for U.S. scientific cooperation (provided in a Supplement to this report);

- An analysis of the extent to which these arrangements depend or do not depend critically on affiliation with UNESCO;

- Suggestions for alternative interim arrangements for facilitating essential U.S. scientific interactions with UNESCO-sponsored programs;

- Initial recommendations of future U.S. directions in multilateral and global scientific cooperation (both within and outside UNESCO).

Significant Sources

The assessment presented in this report drew on two particularly valuable recent reviews of UNESCO science activities that had been prepared in the light of the UNESCO problem: (1) "Natural Sciences in UNESCO: A U.S. Interagency Perspective,"[7] the October 1983 interagency report coordinated by the National Science Foundation (NSF) as a contribution to the US/UNESCO Policy Review, and (2) Science and Technology Programs in UNESCO,[10] the March 1984 report on the policy implications of a U.S. withdrawal from UNESCO prepared by the Congressional Research Service for the Subcommittee on Science, Research and Technology of the House Committee on Science and Technology. The present assessment, based on a broad range of consultations with professional colleagues who have participated in UNESCO-sponsored science activities, adds to the information provided in the above-mentioned reviews. The Approved Programme and Budget for 1984-1985[11] has been used as a basic UNESCO reference document.

Caveats

Limitations and constraints in carrying out this assessment must be emphasized. They were as follows:

- Time Frame. This assessment was prepared in four months. In reviewing such a comprehensive set of programs in such a short time, it has not been possible to contact the full range of science interests involved. A thorough critical review of all science programs has not been possible; the focus of the present study has been on measures to prevent disruptions in the first year or two of U.S. nonmembership in UNESCO.

- Community of Interests. The time constraints have ruled out any detailed evaluation of UNESCO-sponsored science activities, particularly in the area of developing country interests. An in-depth assessment would require, by definition, consultations with scientific peer groups abroad. This has neither been possible nor attempted. It should also be noted that no real attempt has been made to evaluate the field programs of UNESCO. Furthermore, a comprehensive assessment would need to include a careful evaluation of science programs of other intergovernmental organizations and particularly those of the UN system as a whole to better understand interactions and opportunities for promoting more effective international scientific cooperation.

- Information Base. As noted, UNESCO's Approved Programme and Budget for 1984-1985 has been used as a basis for assessing U.S. interests and participation. Like many budget program statements, the UNESCO document does not always convey a clear sense of substantive endeavor. Moreover, the United States lacks an institutional memory and a focal point for monitoring U.S. scientific interactions, both with respect to UNESCO in particular and to multilateral scientific relationships in general.

Contacts with the U.S. Scientific Community

The present assessment has concentrated on bringing into play the personal views of American scientists and engineers who have participated directly, often in leadership roles, in the science activities of UNESCO. The following means were used to do so:

- Contact was initiated in April 1984 with American scientists serving as officers of international scientific unions or serving on corresponding U.S. national committees.

- Officers of U.S. scientific societies and associations were invited to query their members on the value of participation in UNESCO activities.[12]

- In cooperation with the Consortium of Affiliates for International Programs of the American Association for the Advancement of Science, a query was sent to members requesting information on specific experiences and judgments of UNESCO science activities.

- A letter to the editor, Science, April 13, 1984, invited comments from the U.S. scientific community on their participation in UNESCO scientific activities.

- The potential impact of withdrawal on particular science interests was discussed at meetings of U.S. national committees affiliated with international organizations and unions.[13]

- Personal contact was made through interviews (including phone communications) with U.S. scientists and engineers in academia, government, and industry involved in UNESCO science activities, particularly the major observational programs.

This approach has resulted in several hundred communications with American scientists and engineers.

FRAMEWORK FOR THE ASSESSMENT

In preparing the inventory of UNESCO science programs, assessing their dependence on affiliation with UNESCO, and suggesting alternative interim arrangements, the following areas of UNESCO-funded activities appearing in the Approved Programme and Budget for 1984-1985[11] were examined:

- Major Program VI: The Sciences and Their Application to Development

- Major Program IX: Science, Technology and Society

- Major Program X: The Human Environment and Terrestrial and Marine Resources

To a considerably lesser extent, Major Programs V.2 (Teaching of Science and Technology), VII (with respect to Scientific and Technological Information), and General Activities (statistics on science and technology) were reviewed. This material is included in the Supplement.

In order to put the science activities in perspective within the overall UNESCO program, a summary of the overall biennial budget of UNESCO is presented in Annex A. The activities considered in this review account for approximately 30 percent of budgetary resources devoted to regular UNESCO programs. There are also significant contributions to UNESCO science and training activities from other sources--particularly the United Nations Development Program (UNDP), United Nations Environment Program (UNEP), the UN Financing System for Science and Technology for Development (UNFSSTD), and non-UN sources--which are of the same order of magnitude as those provided to regular UNESCO programs. Summary budgetary information on the individual program activities considered in this review (Major Programs VI, IX, X) is provided in Annex B.

In carrying out the assessment, particular attention has been given to budgetary matters in order to be aware of the current U.S. contributions and to make it possible to suggest options for alternative channels of support in the future, including proposals for augmenting selected high-quality activities.

A certain number of questions and factors have been taken into account in proposing alternative channels:

- What are the means and limitations of maintaining U.S. participation and leadership?

- From the viewpoint of the United States, what are the most efficient and simple administrative procedures?

- Alternative channels suggested in this preliminary stage are most likely to be useful only on an interim basis.

- Account must be taken of the need for staff and overhead costs.

- There are special needs for project oversight by a U.S. scientific organization.

- Major consideration has been given to contributions to UNESCO to support specific programs and projects (e.g., Funds-in-Trust, donations, etc.). This approach may provide a simple means of support at a modest overhead charge.

REFERENCES

1. Letter, George P. Shultz, Secretary of State, to Amadou-Mahtar M'Bow, Director-General of UNESCO, December 29, 1983.

2. Memo, Robert C. McFarlane, Assistant to the President for National Security, to George P. Shultz, December 23, 1983.

3. Memo, Robert C. McFarlane to George P. Shultz, February 11, 1984.

4. Charter of the Monitoring Panel on UNESCO, March 22, 1984.

5. Memo, Robert C. McFarlane to George P. Shultz, December 23, 1983.

6. US/UNESCO Policy Review, Department of State, February 29, 1984.

7. Letter of transmittal from Deputy Assistant Director for Scientific, Technological and International Affairs, National Science Foundation, to the Assistant Secretary of State for International Organizational Affairs, October 21, 1983. The report, "Natural Sciences in UNESCO: A U.S. Interagency Perspective," was based on contributions from the U.S. Geological Survey and the National Park Service of the U.S. Department of the Interior, the Forest Service of the U.S. Department of Agriculture, the National Institute of Education of the U.S. Department of Education, the Agency for International Development, and a number of components of the Bureau of Oceans and International Environmental and Scientific Affairs of the U.S. Department of State.

8. Letter from NAS Foreign Secretary Walter A. Rosenblith to Assistant Secretary Gregory J. Newell, October 21, 1983.

9. Letter from NAS Foreign Secretary Walter A. Rosenblith to Assistant Secretary Gregory J. Newell, March 13, 1984.

10. Knezo, G. J. and M. E. Davey. Science and Technology Programs in UNESCO: A Description of the Programs and Preliminary Analysis of the Policy Implications of U.S. Withdrawal for Science (Washington, D.C.: Congressional Research Service, March 1984).

11. Approved Programme and Budget for 1984-1985, 22 C/5 (Paris: UNESCO, January 1984).

12. Meeting with representatives of professional societies, April 17, 1984: Gordon Bixler (American Chemical Society)
David M. Burns (American Association for the Advancement of Science)
Bahaa El-Hadidy (American Society for Information Science)
Marjorie Gardner (American Chemical Society)
J. K. Goldhaber (American Mathematical Society)
Dorothy P. Gray (National Commission on Libraries and Information Science)

William G. Herrold (Institute of Electrical and Electronics Engineers)
Joan M. Jordan (American Meteorological Society)
Steven Kennedy (American Psychological Association)
W. Edward Lear (American Society for Engineering Education);
J. David Lockard (National Association for Research in Science Teaching)
Elliott A. Norse (Ecological Society of America)
Robert L. Park (American Physical Society)
Orr E. Reynolds (American Physiological Society)
Alan N. Schechter (Biophysical Society)
Robert D. Watkins (American Society for Microbiology)
Judith Wortman (American Institute of Biological Sciences).

13. Meetings with U.S. National Committees:
International Union of Pure and Applied Chemistry (3/17)
International Council of Scientific Unions (4/19)
International Union of Pure and Applied Physics (4/25)
International Union of Biochemistry (4/29)
International Brain Research Organization (5/15)
International Geological Correlation Program (6/12)
Internatinal Union of Geological Sciences (6/13)
International Union of Pure and Applied Biophysics (6/14).

Chapter 3

PRELIMINARY CONCLUSIONS

The present chapter summarizes preliminary conclusions of a general nature drawn from the assessments of specific program activities in Chapter 4 and raises a number of issues requiring further analysis. The information is presented in three sections: Assessments of UNESCO Programs, Impacts of U.S. Withdrawal, and Alternative Interim Arrangements. Two tables at the end provide a capsule summary of the assessments, preferred alternatives, and suggested funding levels for each of the principal areas of science activity.

It is important to emphasize that the present study is preliminary in nature. A much more comprehensive study is needed, one which will draw on the knowledge and experience of an even broader spectrum of the U.S. scientific community, as well as colleagues abroad.

ASSESSMENT OF UNESCO PROGRAMS

1. Key Program Areas. This report has attempted to deal with a wide range of scientific and technological activities sponsored by UNESCO. Not surprisingly, these activities vary in size, complexity, quality, and importance. Activities of major interest to the U.S. scientific community are in the following areas:

- Earth Sciences and Resources; Natural Hazards; the International Geological Correlation Program
- Water Resources; the International Hydrological Program
- Oceans and Resources; Coastal Regions; the Intergovernmental Oceanographic Commission
- Man and the Biosphere Program
- Natural Sciences; support of ICSU and activities sponsored by NGOs in the fields of biology, chemistry, physics

Measures need to be taken to plan and facilitate U.S. participation in these program areas if withdrawal from UNESCO becomes effective.

UNESCO work in engineering sciences, social sciences, and science policy appear to be of lesser interest to the concerned U.S. professional communities with only small numbers of U.S. scientists participating. Nevertheless, these are important areas, ones in which there is a potentially important role for American scientists to play.

2. Advancement of Science--Science for Development. Although UNESCO science objectives include the pursuit of new knowledge, particularly in observational scientific fields, increasing attention is being directed toward the science, science education, and advanced training needs of the developing world. The juxtaposition of science at the frontier and science for development highlights the multiple objectives of UNESCO and of nongovernmental scientific organizations. There is need to enhance understanding of the complementary and interactive nature of both these objectives.

3. UNESCO's Intergovernmental Role. As an intergovernmental organization, UNESCO is an important instrument in carrying out global observational programs (e.g., the Geological Correlation Program, oceanographic components of the World Climate Research Program, and the Man in the Biosphere Program). The authority and financial support of governments is often critical to field operations which involve the sovereignty of nations. On their own, nongovernmental organizations cannot substitute for intergovernmental ones in these areas of responsibility.

UNESCO is a critical intergovernmental link to the developing world for the implementation of projects involving advanced training and infrastructure building. These latter projects depend very much on substantive contributions from the advanced countries, primarily through nongovernmental scientific organizations such as ICSU and its constituent bodies.

4. Other Intergovernmental Organizations. Other intergovernmental organizations (e.g., UNDP, UNEP, WMO, FAO, and WHO) participate substantively and financially in many UNESCO-directed science programs. Those that make financial contributions often provide funds of the same order of magnitude as UNESCO's regular program. The UNESCO staff plays an important role in planning, advising, and managing many of these programs.

5. UNESCO and the Scientific Community. One cannot help but be impressed with the large number of UNESCO activities involving significant numbers of scientists who participate either directly or through nongovernmental organizations (NGOs). NGOs play an important role in many aspects of UNESCO's programs, particularly in engaging the participation of scientists in advanced training projects (IBRO, ICRO, MIRCENs) and in guiding/managing certain aspects of observational programs (e.g., IUGS, IUGG, IUBS, SCOR, SCOPE). UNESCO's programs would profit from even greater participation and association with the

NGOs. However, their capabilities to provide guidance and assistance in activities to meet the needs of the developing world could be improved.

6. U.S. Organization. The lack of responsible and scientifically competent oversight of U.S. interests in UNESCO science programs has been and continues to be a serious and chronic problem. A governmental focal point, having the requisite technical capability as well as significant international policy responsibilities, would provide much-needed support for American participation in the science programs of UNESCO. However, such a unit cannot be truly effective in the absence of an integral link to the scientific community and to their organizations. The continuing agenda of this joint enterprise would include:

- Assistance in the planning and implementation of scientific programs at world level;
- Concern for enhancing the participation of developing nations in programs that contribute to the common scientific good;
- Action plans backed by human and financial resources to encourage and support multilateral scientific initiatives.

IMPACTS OF U.S. WITHDRAWAL

1. Scientific Relations. In the short term (through 1985), it will be hard to judge the true impacts of withdrawal on U.S. science interests and on the quality of UNESCO science programs. Even if they appear to be only modest, early provision of resources to ensure continued U.S. participation must be made. In order to maintain confidence both here and abroad in U.S. participation in international science programs, withdrawal must be accompanied by a serious commitment, expressed in policy, institutional, and budgetary terms to a continued and strengthened American role.

2. U.S. Participation in Governance. With the possible exception of the Intergovernmental Oceanographic Commission (IOC) and, to a less certain degree, the International Geological Correlation Program (IGCP), the United States will forfeit the right to participate in the governance of major UNESCO-sponsored cooperative international programs upon withdrawal. Only limited influence can be exerted on the direction of these programs through U.S. participation in the cooperating NGOs. It is important to note again the role played by UNESCO staff in planning, advising, and implementing major programs supported from other sources (e.g., UNDP, UNEP, Funds-in-Trust). Withdrawal may seriously affect possibilities for American participation in program management roles as UNESCO staff members.

3. Discontinuities in UNESCO Planning/Implementation. In the event of U.S. withdrawal at the end of 1984, it will be necessary to

prepare for disruptions in project planning and implementation at UNESCO beginning in early 1985 in view of expected budgetary cutbacks. Although U.S. contributions to UNESCO are not normally due until the beginning of the next fiscal year (October 1, 1985, for FY-86), the lack of assurance of interim support until later in 1985 could contribute to an environment of uncertainty that will hamper UNESCO operations. Different forms of congressional appropriations will have to be found to respond to this extraordinary situation. There is an urgent need to move ahead in the United States with establishment of a joint governmental and nongovernmental mechanism to cope with the situation both in the short and longer term.

4. Disruptions in U.S. Scientific Participation. Uncertainties regarding funding will be disruptive to the many U.S. groups participating in ongoing UNESCO science activities. Some reprogramming of nationally available resources will be necessary. With regard to possible losses in access to data and research localities, it is difficult at this stage to make definitive judgments. The situation will depend, in part, on the degree to which U.S. scientists in their personal capacity would continue to be invited to participate in activities directly under the purview of UNESCO. A decrease in the number of such invitations will have an adverse impact on the quality of UNESCO science projects and consequently also on the benefit of such projects to the U.S. scientific community.

5. Disruptions in the International Research System. A period of uncertainty stemming from withdrawal will be disruptive to international cooperation in science and may strain U.S. scientific relations with peer groups in other countries. U.S. participation in multilateral activities and in the planning of new projects may be affected. Some readjustment and reappraisal of U.S. participation and leadership in international scientific cooperation may occur.

6. Capabilities of NGOs. Once alternative interim arrangements have been put into place, they will need to be evaluated and assessed in terms of how effectively NGOs are able to handle the new and more substantial responsibilities they may have assumed. It is clear that some NGOs as currently structured will have serious difficulties in carrying out greatly expanded roles. Thus, there will prevail, even in the second half of the decade, considerable uncertainty about how proposed new responsibilities can be matched to the capabilities of existing institutions.

7. Need for Enhanced U.S. Scientific Community Involvement. Those science programs that involve direct linkages with the concerned professional communities tend to be the most effective. During the coming months, it will be especially important to maintain and strengthen governmental and nongovernmental interactions, not only in the conduct of present programs, but especially in terms of planning and implementation of future international multilateral science activities.

ALTERNATIVE INTERIM ARRANGEMENTS

The alternative arrangements proposed in this report are aimed at ensuring meaningful U.S. involvement in important UNESCO science activities if the United States withdraws from official membership in the organization at the end of 1984. This report does not address the wider ranging issue of an overall alternative approach to the U.S. role in multilateral science cooperation for the rest of this century. There is clearly an urgent need to do so.

For the major intergovernmental research programs and for other selected science activities in which the United States is involved, utilization of a grant to UNESCO is suggested. For other important science areas of UNESCO activity, support of cooperating organizations is proposed, usually as may be recommended by an appropriate U.S. agent. Thus, it is suggested that a significant portion of the available resources be earmarked for relevant U.S. institutions (governmental and in some cases nongovernmental), which would have important oversight and managerial responsibilities for U.S. participation in UNESCO programs in their particular areas of competence.

The consideration of alternative interim arrangements leads to a number of conclusions, poses a number of unknowns, and raises several issues that require further policy analysis:

1. No Viable Overall Alternative. There is at present no viable overall alternative for UNESCO's science programs. Furthermore, there is no simple set of alternative interim arrangements that will ensure future U.S. collaboration with current or future UNESCO projects. In fact, withdrawal will undoubtedly lead to a multiplicity of channels that may be more or less effective. Whatever alternative mechanisms are implemented, it is extremely important to ensure continuity of funding. Otherwise, irreversible damage to valuable current programs is inevitable. Proposing alternative mechanisms is also complicated by the possibility that the United States may rejoin UNESCO at a later date if appropriate reforms are achieved.

2. Danger of Fragmentation. Putting in place a variety of interim alternative arrangements for future funding and participation will result in a fragmentation of scientific and administrative relations. Moreover, there will be serious substantive, managerial, and financial costs that cannot be underestimated. However, the fact that UNESCO's activities include both development assistance programs and programs aimed at the advancement of scientific research makes the search for a single alternative extremely difficult, if not impossible.

3. Specific Program Support to UNESCO. In many cases, the most attractive and administratively simple alternative might be specific program support to UNESCO through the mechanism of Funds-in-Trust or donations. This type of contribution would be appropriate for large portions of the IOC, MAB, IGCP, and the IHP. It suffers, however, from the fact that there may be a lack of direct oversight (except for the IOC where the United States plans to retain membership). Perhaps some

form of periodic accountability could be required. At the very least, a strong focal point in the U.S. government will be extremely important. Mechanisms for program support to UNESCO will require clarification of the possibilities and limitations involved, particularly in terms of the U.S. role in program planning and implementation.

4. Cooperating Organizations. Subject to acceptance by cooperating organizations, it is relatively simple to propose alternative interim arrangements for those activities and programs for which well-established mechanisms of collaboration are in place, as is the case with ICSU, IBRO, ICRO, etc. One special situation is the Intergovernmental Oceanographic Commission (IOC), in which the United States can retain full membership even in the event of withdrawal from UNESCO. Other arrangements are primarily based on the current active advisory and managerial roles played by international nongovernmental scientific organizations (NGOs) in UNESCO-sponsored activities. However, there may be serious problems in planning new global observational programs that require intergovernmental cooperation and oversight.

5. Need for Consultations. The suggestion or designation of another intergovernmental or nongovernmental organization to act in the interim, on behalf of U.S. scientific interests requires careful negotiations and understandings that are agreed to by all sides involved. This will be a complex process in which the issues will need to be clarified over time. Also, there is as yet no way to judge how colleagues from other countries will react to U.S. proposals for alternative mechanisms of support for UNESCO science programs.

6. Role of ICSU. With respect to NGOs, the International Council of Scientific Unions (ICSU) might be considered the most logical candidate to facilitate U.S. participation in some well-established programs. ICSU could, for instance, be asked to oversee some $1.5 million of U.S. funds in order to ensure continuing U.S. participation and support of current UNESCO-sponsored activities in Major Program VI (Natural Sciences). There are possibilities of doubling this level if ICSU were to assume additional responsibilities with respect to the International Hydrological Program, the Man and the Biosphere Program, and certain aspects of the earth sciences activities. ICSU's willingness and capacity, structural and administrative, to assume this level of responsibility, however, will need to be thoroughly considered and discussed by all parties. In the longer term, ICSU represents an important, existing potential for enhancing international science cooperation.

7. U.S. Management Responsibilities. It is tempting to try to identify a single U.S. government agency to provide oversight, management, and funding for U.S. participation in the science activities of UNESCO. The National Science Foundation (NSF) is one obvious possibility, although the NSF has not been especially active in the area of multilateral science cooperation. Also, some adjustments in existing NSF procedures would have to be made. In addition, there are some

agencies, such as the U.S. Geological Survey (USGS), which have active and direct roles in current UNESCO programs. Nonetheless, given the uncertainties of using other international organizations, an enhanced role by U.S. agencies seems inevitable, particularly at this first stage of nonmembership in UNESCO.

Clearly, there must be a nongovernmental focus as well. A complementary, working relationship between a governmental entity, such as the NSF, and a nongovernmental one, such as the National Research Council, would provide a mutually beneficial, solid foundation for expanded and strengthened American participation in international science. Moreover, such a relationship might reinforce a parallel one at the international level between UNESCO and ICSU.

8. Next Step. The NRC assessment has profited from several hundred communications from American scientists and engineers who have participated directly, often in leadership roles, in the science activities of UNESCO. The resulting information base presents a useful starting point for a deeper analysis, an analysis which will require considerably more time and the involvement of a much broader segment of the international scientific community. In order that such an analysis be of value, it must necessarily relate UNESCO programs to those of other multilateral institutions having science as a significant part of their mandate.

9. The Future of International Institutions for Science Cooperation. This review strongly suggests that considerable thought needs to be given to the kinds of multilateral entities that might be established to deal with the contemporary requirements of international science cooperation. Before making premature judgments on selecting or formulating such entities, it is essential to consult with colleagues here and abroad regarding their concerns, interests, and aspirations. The time may have come to begin discussions of new models for facilitating international cooperation both for the advancement of scientific knowledge and for strengthening infrastructures in developing countries. Lessons can be learned from an examination of current practicies (e.g., IOC, ICSU/UNESCO, MAB) directed toward enhancing the complementary capabilities of nongovernmental and governmental organizations.

Science and technology are no longer secondary interests of governments; they have become primary influences on health, economic development, environmental conditions, and all other aspects of modern society. In view of this complex and pervasive state of science in the world today, it may be necessary in the longer term to consider radical institutional changes ranging from establishment of a separate entity for international science to a complete reorganization and restructuring of present institutions.

CAPSULE SUMMARY OF UNESCO SCIENCE PROGRAM:
ASSESSMENTS, INTERIM ARRANGEMENTS, AND PROPOSED FUNDING LEVELS

Program	Preliminary Assessment	Interim Arrangement*	Proposed Funding**
Earth Sciences and Resources; Natural Hazards	High quality program that includes 80-nation IGCP, a program of keen interest to U.S. earth scientists, as well as important projects related to interdisciplinary studies of the earth's crust and data/mapping work. Activities related to hazard assessment and risk mitigation are also useful.	Specific program support to UNESCO to continue U.S. participation in IGCP ($200,000), and other activities ($650,000). Additional resources to cooperating international organizations, governmental and nongovernmental, on recommendation of a U.S. agency such as USGS ($1,150,000).	$2,000,000
Water Resources	U.S. scientists prominent in planning and implementation of 100+ nation IHP, which is concerned with water resource management, particularly in arid and semi-arid regions, and humid tropical regions. U.S. scientists make significant technical contributions and value UNESCO's facilitative role in fostering interactions with foreign colleagues.	Specific program support to UNESCO to cover U.S. share of costs ($750,000) plus support to a U.S. agency such as USGS (Committee on Scientific Hydrology) for additional related activities ($250,000).	$1,000,000
The Ocean and Its Resources	UNESCO is an important mechanism for international cooperative marine science activities. U.S. interest high in oceanographic components of the WCRP, IGOSS, and IODE activities of the IOC. U.S. scientists also involved in studies of marine environment and the continental margin, as well as work on coastal island systems under MAB.	Specific program support to UNESCO for the U.S. share of the current costs ($1,400,000), with additional resources for U.S. oversight and international research activities administered by U.S.agencies (such as NSF and/or PIPICO and USMAB) that would emphasize utilization of cooperating organizations ($1,100,000).	$2,500,000

Man and the Biosphere Program	U.S. scientists active in 105-nation MAB, which is concerned with integrated approaches to natural resource management in 4 areas: humid tropics, arid and semi-arid zones, urban systems, and conservation. UNESCO has facilitated global interations in this interdisciplinary program. UNESCO has recently responded to pleas to improve management structure. USMAB funding problems require resolution.	Specific program support to UNESCO ($900,000) plus support of USMAB-managed activities, including secondment of a U.S. science administrator to the UNESCO Secretariat and increased utilization of NGOs ($1,100,000).	$2,000,000
Natural Sciences; support of ICSU and other NGOs	Important support to research, training, and international cooperation in physical and life sciences. Includes support for NGOs working at the frontiers of science plus development of national infrastructures. Many U.S. scientists active through NGOs.	Direct support to NGOs, via ICSU, for UNESCO-related science activities ($1,500,000) and support through a U.S. agency, such as NSF, for additional related activities ($300,000).	$1,800,000
Informatics, Applied Microbiology, and Renewable Energy	All three areas are important, but except for applied microbiology and certain training aspects in the informatics area, the most appropriate forum may not be UNESCO.	Informatics: Funding through a U.S. agency, such as NSF, with possible use of UN agencies such as UNIDO or UNDP on advice of U.S. professional organizations ($500,000). Applied Microbiology: Direct contribution to UNESCO for MIRCENS ($125,000), plus additional support for related activities via a U.S. agency, such as NSF ($125,000). Renewable Energy: Support activities via UNDP ($250,000).	$1,000,000

*The consideration of UNESCO subprograms in Chapter 4 proposes more than one alternative interim arrangement. Only the preferred alternative is included in this summary presentation.

**The proposed figures include overhead costs.

Program	Preliminary Assessment	Interim Arrangement	Proposed Funding
Engineering Sciences	Emphasis is on training and development of engineering curricula; program management by UNESCO, but mostly financed by UNDP. Limited involvement by U.S. engineers in these UNESCO-directed activities.	Funding through a U.S. agency, such as NSF, to U.S. engineering societies and universities for work with international and regional professional organizations.	$700,000
Social Sciences	International social science mechanisms are weak and underfunded. UNESCO's program needs significant reform in content and management. U.S. social scientists have had limited involvement in UNESCO projects.	Funding through a U.S. agency, such as NSF, to support international cooperative social science research and training activities. U.S. share of subventions to ISSC should be maintained.	$1,000,000
Science Policy	A minor program with little, if any, U.S. participation; subject is of general interest (S&T planning and impact of S&T on society), but UNESCO program not particularly productive.	Funding through a U.S. agency (e.g., NSF) to support international science policy activities through U.S. institutions, possibly utilizing such organizations as OECD, OAS, ASEAN.	$750,000
		TOTAL	$12,750,000
		OVERALL U.S. MANAGEMENT OF SCIENCE PROGRAM	$1,250,000
		GRAND TOTAL	$14,000,000

UNESCO SCIENCE PROGRAMS

SUMMARY OF SUGGESTED FUNDING LEVELS ($000)
AND ALTERNATIVE INTERIM ARRANGEMENTS

		CURRENT ANNUAL PROGRAM	U.S. SHARE	ALTERNATIVE*	PROPOSED U.S. FUNDING
VI.	THE SCIENCES AND THEIR APPLICATION TO DEVELOPMENT				
VI.1	Natural Sciences	6,800	1,700	NGOs (e.g., ICSU, ICRO)	1,500
				NSF/NRC/AID	300
VI.2	Engineering Sciences	4,600	1,150	NSF/NRC/AID	700
VI.3	Key Areas--Informatics,	6,000	1,500	NSF/NRC/AID	625
	Microbiology			FIT**	125
	Renewable Energy			GOs	250
VI.4-5	Social and Human Science	7,800	1,950	NSF/NRC	1,000
	SUBTOTAL VI	(25,200)	(6,300)		(4,500)
IX.	SCIENCE, TECHNOLOGY AND SOCIETY	6,200	1,550	NSF/NRC/AID	750
	SUBTOTAL IX	(6,200)	(1,550)		(750)
X.	THE HUMAN ENVIRONMENT & TERRESTRIAL & MARINE RESOURCES				
X.1	Earth's Crust	3,500	875	FIT	600
				USGS/NGOs (e.g., IUGS)	900
X.2	Natural Hazards	1,500	375	FIT	250
				USGS/NGOs (e.g., IUGS), IGOs (e.g., UNDRO)	250
X.3	Water Resources	4,400	1,100	FIT	750
				USGS	250
X.4-5	Marine Sciences	9,000	2,250	FIT	1,400
				NSF/PIPICO/USMAB	1,100
X.6-9	Ecological Sciences, MAB	7,400	1,850	FIT	900
				SECONDMENT	150
				USMAB	950
	SUBTOTAL X	(25,800)	(6,450)		(7,500)
	TOTAL VI, IX, & X	57,200	14,300		12,750
	U.S. OVERSIGHT				1,250
	TOTAL				14,000

*The consideration of UNESCO subprograms in Chapter 4 proposes more than one alternative interim arrangement. The preferred alternative is included in this summary presentation.

**Funds-in-Trust = direct grant to UNESCO for specific activities.

Chapter 4

ASSESSMENTS AND INTERIM ARRANGEMENTS

INTRODUCTION

This chapter addresses the following UNESCO Major Programs and sub-programs:

VI. The Sciences and Their Application to Development

- Natural Sciences (VI.1); Technology and Engineering (VI.2); Key Areas (VI.3)
- Social and Human Sciences (VI.4); Key Areas (VI.5)

IX. Science, Technology and Society

- Relations (IX.1); S&T Policies (IX.2)

X. The Human Environment and Terrestrial and Marine Resources

- Earth Sciences and Resources (X.1); Natural Hazards (X.2)
- Water Resources (X.3)
- Oceans and Resources (X.4); Coastal and Island Regions (X.5)
- Environmental Sciences: Man and the Biosphere (X.6-X.9)

Comments on each of the above areas of activity are presented in three parts: (1) a program assessment, including potential impacts of a U.S. withdrawal, (2) suggested alternatives, and (3) a summary of preliminary findings.

Budgetary information is provided to give an order of magnitude of resources invested in the various activities (including particularly the current U.S. contribution of 25 percent). Frequently there is a significant multiplier effect in UNESCO-supported activities due to the contributions from national and other sources.

With respect to budgetary considerations it is important to note the following:

- Budgetary amounts for the various UNESCO activities include three elements: project costs, staff costs, and overhead. In UNESCO usage, program costs are the total of project and staff costs.

- One cannot predict how UNESCO will redistribute its budgetary resources given a 25 percent reduction due to the U.S. withdrawal. It is likely that certain areas may be affected more than others; however, for this analysis, a 25 percent cut across the board has been assumed.

- It is assumed that the funds available to support U.S. scientific collaboration in current UNESCO-sponsored science programs will be in the range of the present U.S. contributions to UNESCO for science, that is, about $14 million per year.

- Preliminary budgetary proposals have been included in program assessments as part of the process of understanding the implications of alternative interim arrangements. These proposals are intended to be helpful in planning and preparing budgets for future U.S. participation.

Several factors have been taken into consideration in suggesting alternatives to permit continued U.S. participation in UNESCO programs once the United States ceases to be a member (see Chapter 2). For certain activities of particularly high quality, augmented levels of resources are recommended. In other instances, reductions are proposed. In a few areas, questions are raised regarding UNESCO's involvement. Considerable attention is given to U.S. oversight requirements to properly plan, guide, and evaluate U.S. participation in multilateral scientific activities whatever the U.S. relation to UNESCO.

As noted, the current annual level of U.S. support of UNESCO science is about $14 million. The present review of UNESCO science programs results in a suggested support level of $12 to $13 million per year. It is important to underscore that oversight/managerial responsibilities on the U.S. side will require significant additional funding and possible adjustment in personnel policies within government agencies to administer these programs. It is proposed that $2 to $3 million per year be budgeted for the support of (a) U.S. oversight responsibilities, (b) new initiatives on development of global observational programs, and (c) resources for increased opportunities for U.S. scientists to participate in multilateral science programs, including scientific meetings sponsored by the international scientific unions and other nongovernmental scientific organizations. These budgetary amounts are, at best, first approximations that will need to be considerably refined.

MAJOR PROGRAM VI:
THE SCIENCES AND THEIR APPLICATION TO DEVELOPMENT

Natural Sciences; Technology and Engineering; Key Areas (VI.1, VI.2, VI.3)

This portion of Major Program VI includes UNESCO-sponsored activities in the natural (physical and life) sciences and engineering. The quality of effort and the role of UNESCO vary considerably among the program activities--these are addressed within the individual assessments for subprograms VI.1, VI.2, and VI.3. The current annual budget

for program costs (projects and staff) plus overhead is approximately $17.3 million--the U.S. share (25 percent) would be $4.3 million. Restricting attention to only program costs ($10.5 million), the U.S. share (25 percent) would be about $2.6 million per year. Other "outside" sources of support total more than $17.8 million per year.

It is proposed that support be provided UNESCO-related program activities through a variety of alternative interim arrangements at an indicative annual budget of $3.5 million per year.

Research, Training, and International Cooperation in the Natural Sciences (VI.1)

Assessment/Potential Impacts

This program area, involving international cooperative activities directed toward the advancement of knowledge and the strengthening of national research and training capabilities, is important to the health of world science. Program activities include a variety of advanced research and training courses in mathematics, physics, chemistry, and biology either on a regional basis or at international centers; university curricula development projects in the sciences; and support of regional and international scientific cooperation through subventions and grants to NGOs and universities. The long-standing collaborative arrangement between UNESCO and nongovernmental science organizations permits the building of more effective global networks of researchers at the frontiers of science; this leads, in turn, to fostering the development of infrastructures in the Third World. At the same time, increasing attention is being given to supporting activities in the regular UNESCO science programs to meet the specific needs of developing countries.

The current annual UNESCO budget for program costs (projects and staff) plus overhead is approximately $6.8 million; of this, the U.S. share would be $1.7 million. Considering program costs only ($4.1 million), the U.S. share would be about $1 million per year. Other "outside" sources of support, primarily UNDP, contribute more than $4.9 million per year, or somewhat more than the total for the regular UNESCO program.

This program area contains a large number of training and support activities involving the scientific unions and international centers such as the Trieste International Center for Theoretical Physics (ICTP), and the Johns Hopkins School of Hygiene and Public Health. Specialized organizations such as the International Cell Research Organization (ICRO), the International Brain Research Organization (IBRO), and the newly formed International Organization for Chemistry for Development (IOCD) provide advanced research training and services in support of the needs of the developing world. A large number of U.S. scientists are involved as teachers in an environment that encourages learning on the part of all participants.

Given the role of the International Council of Scientific Unions (ICSU) in the advancement of basic scientific research and in bringing

together the leading scientists of both developed and developing countries, many UNESCO activities critically depend on ICSU. Therefore, the UNESCO subvention (about $540,000 per year) to ICSU and the support of specialized activities by ICSU's constituent bodies are of particular importance.

The above-named activities and organizations depend to varying degrees on UNESCO support, but such support (largely catalytic) is particularly important for training activities in the developing world since UNESCO provides the intergovernmental link to countries and regions having limited affiliation with nongovernmental scientific associations. It is true that these collaborating organizations can receive funds from a variety of sources and do so. It is also true that limited administrative structures within NGOs proscribe their capacity to greatly augment program responsibilities were they to choose to do so. However, the nongovernmental scientific organizations and associations could provide a great deal more advice and assistance to UNESCO projects, thus increasing their quality and efficiency. Therefore, staff and administrative costs for NGOs need to be included in consideration of alternative interim arrangements. Furthermore, there would be significant U.S. oversight costs to be borne by an appropriate organization sensitive to U.S. interests (NSF and/or NRC) in channeling support to a variety of organizations and project activities.

Alternatives

A preferred interim arrangement is to provide the current level of U.S. contributions to UNESCO program costs in this area ($1.1 million per year) to the relevant nongovernmental organizations through ICSU. In fact, support of NGO-administered activities should be augmented to a level of $1.5 million per year. This level might include the seconding of a science administrator to ICSU. An additional provision of $300,000 for bilateral programs involving U.S. professional groups and universities is suggested, raising the total to $1.8 million per year. All of these arrangements would require agreements with the organizations concerned; support levels would have to include appropriate managerial, oversight, and overhead costs, which could be significant.

A second option for alternative support of these program activities would be an annual contribution to UNESCO (Funds-in-Trust, donations, etc.) for the U.S. share (25 percent) of regular program costs in this area, plus an estimated 10 percent overhead charge, or a total of $1.1 million. In addition, it is recommended that about $700,000 be provided to selected multilateral science activities through grants to the relevant nongovernmental scientific organizations. Such augmented support would raise the total level of support of VI.1 activities to $1.8 million per year, or about the same as the present U.S. contribution.

Preliminary Findings

1. UNESCO provides significant support to research, training, and international cooperation in the natural sciences. Beyond the subvention to ICSU, of importance to all countries, this program provides valuable advanced training through regional and international projects directed toward the needs of developing countries.

2. UNESCO provides a critical intergovernmental link to these developing countries. But these UNESCO-sponsored projects also depend on substantive contributions from the advanced countries primarily through the nongovernmental scientific organizations, particularly ICSU and its bodies. U.S. support of UNESCO-related scientific projects could be provided to nongovernmental organizations through ICSU. U.S. scientists would probably be able to maintain the current level of participation in these programs through the nongovernmental organizations.

3. These international cooperative activities could be complemented through grants to U.S. universities and professional groups.

4. It is important to establish and support an oversight capability within a body sensitive to U.S. interests, such as NSF and/or NRC. Certain aspects of these programs are relevant to the interests of the Agency for International Development (AID). Administrative overhead costs will be significant.

5. The overall record of VI.1 activities is reasonably good; the program has been of service to UNESCO Member States and to NGOs. With improved management, even further contributions can be foreseen and therefore this area is a candidate for increased funding.

Research, Training, and International Cooperation in Technology and the Engineering Sciences (VI.2)

Assessment/Potential Impacts

This program area is directed toward the improvement of institutional infrastructures in developing countries in the fields of engineering sciences and technology with particular emphasis given to meteorology, materials testing, quality control, data processing, standardization, and technical information services. The major thrust of the program is training, the development of engineering curricula through a variety of activities in the advanced countries, regional cooperation, and strengthening of national research and training infrastructures. The current annual UNESCO budget for program costs (projects and staff) plus overhead is approximately $4.6 million--the U.S. share is $1.2 million. Considering program costs only ($2.8 million), the U.S. share is about $700,000 per year. Other "outside" sources of support in this area, primarily UNDP and

Funds-in-Trust, provide more than $11.6 million per year or about four times the magnitude of the regular UNESCO program.

This program area includes a large number of support activities involving international engineering societies and organizations, as well as national centers in the advanced countries providing special training to meet the needs of the developing world. There are important interactions with UN-financed programs in support of strengthening technical and engineering training linked to specific development projects in the nations concerned. As far as UNESCO-directed activities are involved, there has been apparently limited participation from the U.S. technical/engineering community (no U.S. universities are involved in the provision of training needs). Considerably more analysis is required to understand the reasons for this situation. Presumably the U.S. engineering professions could contribute on a multilateral basis, particularly in the area of strengthening engineering curricula development and training of faculty. Significant levels of support for engineering sciences are provided from other sources, particularly UNDP. UNESCO plays a major role in the management of these funds, and with a U.S. withdrawal from UNESCO, there would be even less opportunity to influence their utilization of these funds.

Certain aspects of the program dealing with industrial policy and the provision of supporting technical services might be more appropriately managed by other UN bodies, such as the United Nations Industrial Development Organization (UNIDO). The UNESCO role should be directed more toward providing guidance in the development of engineering curricula and training of faculty.

Alternatives

U.S. support of UNESCO program costs in this important area of the promotion of engineering sciences is $700,000 per year. Instead of contributing funds directly to UNESCO, it is proposed that this level of resources, under monitoring by an appropriate body sensitive to U.S. interests (NSF and/or NRC), be provided through grants to U.S. engineering societies and universities working closely with international and regional professional organizations such as the World Federation of Engineering Organizations (WFEO). The objective would be to strengthen the involvement of the U.S. engineering community in UNESCO and in other UN engineering training and curriculum development activities.

A second option would involve direct support at a level of $350,000 per year for targeted activities within UN agencies such as UNDP, UNIDO, and the the UN Financing System for Science and Technology for Development. Support of engineering education activities to reinforce UNESCO projects could be provided at a level of $350,000 per year to U.S. professional societies and universities.

It is important to note that proposed levels of resources to be devoted to these activities would have to include appropriate managerial, oversight, and overhead costs.

Preliminary Findings

1. There has been only limited interaction with U.S. engineering societies and universities in this area of UNESCO interests. UNESCO has broadened its engineering interests to intersect with responsibilities of other UN organizations such as UNIDO. UNESCO should concentrate its efforts on engineering education.

2. As an alternative interim arrangement, U.S. engineering societies and universities could provide significant contributions to UNESCO-related educational activities through regional and international professional organizations such as the World Federation of Engineering Organizations (WFEO). A second alternative for supporting these activities would involve other UN organizations such as UNDP, UNIDO, and the UN Financing System.

3. It is important to establish an oversight capability within a body sensitive to U.S. interests, such as NSF and/or NRC, working with U.S. professional societies and engineering institutions.

Research, Training, and International Cooperation in Key Areas in Science and Technology (VI.3)

Assessment/Potential Impacts

This program area is directed toward the dissemination of technologies in informatics (information processing, systems development), applied microbiology (including biotechnology), and use of renewable energy sources. The current annual UNESCO budget for program costs (projects and staff) plus overhead is approximately $6 million--the U.S. share is $1.5 million. Restricting attention to program costs ($3.6 million), the U.S. share is about $900,000 per year. Other "outside" sources of program support provide a total $1.25 million per year.

Special attention has been devoted to these three rapidly developing fields because of their significance to the economic and social development of all countries and particularly because of the need to help developing countries master and effectively exploit such technologies for their national and regional benefit. UNESCO sponsors and supports important training activities, provides advisory services to assist the development of research policies and their infrastructures, and promotes the establishment of regional and global networks of research training and exchange of science and technology (S&T) data and information. Since there are other UN organizations charged with promoting applications and industrial development in some of these areas, one might question the wisdom of UNESCO's assuming responsibilities in many aspects of informatics and the renewable energy resource sector. International collaboration in all of these sectors merits strong encouragement; UNESCO may not be the most suitable or effective instrument.

With respect to informatics, UNESCO-related activities should be concentrated in work pertaining to training and much more limited advisory services for the development of strategies and definition of acquisition needs. A number of options are available to forward these latter interests outside UNESCO.

The UNESCO-sponsored activities in the area of applied microbiology and biotechnology are of particular quality--they are cost-effective and worthy of encouragement. It is recommended that serious attention be given to supporting the further development and strengthening of Microbiological Resources Centers (MIRCENs)* and their interactions in support of global and particularly of developing country interests. A modest increase in support of this work is proposed.

The renewable energy program should be examined in light of the suitability of other intergovernmental agencies concerned with energy R&D, as well as in the light of leadership that could be provided by U.S. institutions. It is proposed that modest support be provided for renewable energy activities through other multilateral institutions or through U.S. nationally managed programs designed to meet the needs of developing countries.

In the short term, the impact on U.S. interests of a U.S. withdrawal from UNESCO in these areas would be minimal--it is likely that U.S. scientists and engineers would continue to be invited on a personal basis to participate in activities pertaining to these three fields, particularly informatics and microbiology. In the long term, both U.S. interests and UNESCO capabilities would be harmed--the United States from diminished access to the global microbiological community, UNESCO programs from the loss of the considerable U.S. technological "know how" that has been developed in these three areas of concern.

Alternatives

In proposing alternatives, the considerations are different in each of the three areas. With respect to informatics, support is suggested to U.S. institutions via NSF ($500,000). In the microbiology area, support is also proposed to U.S. institutions via NSF ($125,000) in combination with direct support to MIRCENs via Funds-in-Trust ($125,000). Support of work on renewable energy sources could be provided directly to other UN agencies such as UNDP or UNIDO ($250,000). The total proposed level of support for all three areas is $1 million per year.

Another option is to provide support of informatics via Funds-in-Trust; MIRCENs via ICSU or ICRO and U.S. institutions; and renewable energy via U.S. institutions.

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*There are centers throughout the world; three are in the United States.

Preliminary Findings

1. UNESCO provides valuable support of the Microbiological Resources Centers (MIRCENs). The United States should consider increasing support of these high-quality activities.

2. Support of informatics projects should be limited to training and some advisory services for the development of strategies and definition of acquisition needs. Future U.S. support should be provided through U.S. institutions which may wish to utilize UN agencies (e.g., UNIDO or UNDP) and the International Federation of Information Processing (IFIP). Oversight by a U.S. body such as the Association for Computing Machinery (ACM) should be considered.

3. Modest support of work on renewable energy sources should be channeled to other UN agencies (e.g., UNDP) with close oversight by an appropriate U.S. body sensitive to U.S. interests.

4. The proposed alternative interim arrangements suggested above probably provide more direct oversight of substantive activities than is currently the case; however, the administrative overhead costs cannot be ignored.

MAJOR PROGRAM VI:
THE SCIENCES AND THEIR APPLICATION TO DEVELOPMENT

Social and Human Sciences; Key Areas
(VI.4 and VI.5)

Assessment/Potential Impacts

The purpose of VI.4 activities is to develop the social and human sciences by strengthening national potential for university and post-graduate training and research, regional cooperation, and international cooperation--the last through support to NGOs and subventions to the International Social Science Council (ISSC) and the International Committee for Social Science Information and Documentation (ICSSD).

Program VI.5 activities are directed toward improving education and advanced training in selected key areas such as history, geography, linguistics, anthropology, and the administrative and management sciences--with special attention to work and leisure activities, interdisciplinary cooperation for the study of man, and studies on the status of women. The current annual UNESCO budget for VI.4 and VI.5 program costs (projects and staff) plus overhead is approximately $7.8 million--the U.S. share is about $1.9 million. Restricting attention to program costs ($4.7 million per year), the U.S. share is about $1.2 million per year. Other sources of support in this area total $263,000 per year which are insignificant with respect to regular program support.

There is no way to know with certainty the actual extent to which the U.S. social science community benefits from participation in UNESCO.

On the level of the individual researcher, a number of U.S. social scientists interviewed indicated that the level of U.S. participation was "embarrassingly low." Among the reasons suggested were: (1) insistence within UNESCO upon country-specific "microprojects" as defined by the social science community within the country in question, (2) resistance to the global project approach, (3) inability of the U.S. National Commission for UNESCO to involve U.S. researchers, and (4) inability of official U.S. representatives in Paris to communicate with the U.S. social science community. On the other hand, there are issues under debate within the UNESCO context that are of major concern to the U.S. social science community.

Perhaps the most frequently cited example is the methodological debate that has been ongoing since the mid-1970s about the "indigenization" of social science, which is the contention of some developing countries that social science as it has developed in the West has predominantly served the interests of Western countries. It is argued on this basis that social science research in a developing country should be undertaken only by nationals of that country (or only with limited access by foreign researchers) and from a point of view that promotes their national interest. Here, according to some, lies the danger, because they believe that such a methodological prescription is not value free and "veers dangerously toward ideology." Clearly, if the United States is absent from this debate within UNESCO, it will be able to do very little to prevent this view from prevailing, with all of its implications for the direction, vitality, and legitimacy of international research in such fields as anthropology, sociology, and political science.

While U.S. researchers do not participate in UNESCO programs in a major way, withdrawal would cause the United States, as the single largest country contributor, to lose its ability to influence the substantive content of the organization's programs. U.S. social scientists undoubtedly would still be able to obtain UNESCO publications and possibly might even be able to participate in research projects, colloquia, and symposia on an individual basis. But, given the fact that the U.S. social science community is the largest and one of the most highly developed in the world, there would be no direct means of representing its interests in the design or development of programs. Similarly, the United States would lose even its present limited ability to influence the direction of ongoing UNESCO programs, particularly those in current "sensitive" areas, such as arms control and human rights.

Most of the social scientists interviewed were in agreement that withdrawal would have a negligible impact on current research projects ongoing within the U.S. academic community. However, there was also a good deal of speculation that future access by U.S. researchers to field sites in some Third World countries might well be constrained, either in direct retribution for the U.S. withdrawal or because the work was being conducted under UNESCO auspices. Some also suggested that U.S. researchers might find it more difficult to gain access to social science networks in the East European countries, since UNESCO is the principal forum for such contacts.

It was pointed out that many of the nongovernmental organizations dealing with social science depend in some measure on UNESCO subvention for their survival. Thus, organizations such as the International Political Science Association (IPSA) and others might become financially vulnerable and more limited in their substantive activities if their UNESCO support is reduced. But perhaps the most severe financial impact would be felt among the Third World countries (particularly in Africa) where UNESCO support for social science research accounts for a major portion of the work ongoing in those fields. Concerns about "indigenization" not withstanding, the United States would suffer, along with the remainder of the global social science community, if work in these countries were to be diminished through lack of support or if international communication of results were to be reduced.

The benefits to the U.S. social science community* of membership in UNESCO are both direct and indirect. Direct benefits accrue from the limited number of research projects and research colloquia and symposia in which U.S. scholars participate. Access is gained through these activities both to data and to collegial networks, i.e., "invisible colleges," throughout the world. Through UNESCO colloquia and symposia, scholars are able to exchange ideas, concepts, and theories that ultimately promote the advancement of their disciplines.

The Social Science Committee of the U.S. National Commission for UNESCO has urged repeatedly that UNESCO develop a more vigorous research program, similar to that which existed shortly after its creation when it sponsored research on international tensions and on racism. The committee has suggested that UNESCO inaugurate a major program on migration, which has important implications both for social science theory and for policy. Expansion or development of such substantive research foci would add directly to the benefits derived by the U.S. social science community.

U.S. social scientists also derive benefit from several UNESCO publications, including the World List of Social Science Periodicals and the World Directory of Social Science Institutions. It is reported that scholars make use of UNESCO publications in substantive areas such as the impact of new communication technologies on education, communications in developing countries, and the status of women. Some scholars apparently also find useful some issues of the UNESCO-edited Journal of International Social Science,** although there are questions about its overall quality and the cost of its subvention.

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*Thinking in this section benefitted from the ideas of Harold K. Jacobson presented in a statement before the Subcommittee on Human Rights and International Organizations and International Operations of the Committee on Foreign Affairs, U.S. House of Representatives, April 26, 1984.

**It should be noted that the editor of the Journal of International Social Science, Peter Lengyel, resigned recently due to unacceptable constraints imposed by the UNESCO Secretariat.

Indirect benefits of U.S. participation relate to the importance of promoting the worldwide development of the state of the art in global social science research, particularly with respect to the Third World. The argument here rests on the importance of gaining access to data and on the ability to exchange and/or test new ideas, concepts, and theories. It has also been suggested that another indirect benefit of a vigorous social science community within a country is the contribution that many of the disciplines can make on the quality of policy debate.

Alternatives

Prospects appear poor for making alternative arrangements for the United States to continue to play a role in UNESCO social science activities while not actually being a part of the organization. Given the limited involvement of the U.S. scholarly community in these programs and the serious methodological questions that have arisen with regard to the "indigenization" of social science research in the Third World, there would appear to be little incentive or justification for utilizing the Funds-in-Trust arrangement. It is conceivable that other UN organizations, such as United Nations Institute for Training and Research (UNITAR), United Nations University (UNU), United Nations Research Institute for Social Development (UNRISD), the International Labor Organization (ILO), the World Bank, or the various UN regional economic commissions (e.g., the Economic Commission for Latin America [ECLA]) might be able to pursue in a very limited way some of the social science activities of UNESCO.* However, this would require that other countries besides the United States also agree to channel funds through these alternative channels, and it raises the real prospect of serious duplication of effort within the UN system. Many of those interviewed for this study expressed skepticism about this approach.

Outside of the UN system, the opportunities for cooperation and collaboration in the social sciences are somewhat limited. While virtually all of the disciplines involved have active professional societies, the international arms of these nongovernmental organizations are generally weak and underfunded. In fact, most depend in some measure on UNESCO for subvention. The U.S. Social Science Research Council does maintain active working relationships around the world, and this mechanism could well provide a basis for bilateral research projects under some circumstances. There is also the International Social Science Council and the Inter-University Consortium for Political and Social Research, both of which historically have been primarily West-West in their orientation but could conceivably be strengthened and expanded to include a Third World component.

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*It is worthy of note that economics is not found under subprogram VI.4-5. Economics comes into the work of UNESCO under Major Program VIII, which is entitled, "Principles, Methods and Strategies of Action for Development."

In the final analysis, the best alternative funding strategy if the United States follows through on its intention to withdraw from UNESCO would be to make the bulk of the funds available either directly to researchers or through the disciplinary professional organizations. Some portion of the funds might be reserved for the International Social Science Council to make up any loss in subvention due to U.S. withdrawal from UNESCO and also to undertake truly multilateral activities.

A logical new institutional focal point for funding international social science research to be carried out by U.S. investigators would be the Directorate of Biological, Behavioral, and Social Sciences (BBS) of the National Science Foundation. While it is possible that BBS might wish to evaluate grant applications and administer such additional funds directly, there may also be some substantive and symbolic value in establishing close collaborative relationships with the Social Science Research Council (SSRC) or the Commission on Behavioral and Social Sciences and Education (CBASSE) of the National Research Council. The substantive benefit to the program of this approach would be access to some of the leading U.S. social science scholars and the substantive input they could provide in determining priorities and direction. They could also provide assistance in strengthening social science research capabilities in developing countries. Moreover, as nongovernmental organizations, both institutions are probably better equipped to arrange site access and other types of scholarly activities--particularly with socialist and certain Third World countries--that might be difficult if initiated by an agency of the federal government. Some portion of the social science funds would need to be applied to staffing and overhead if the SSRC or CBASSE were charged with these new administrative responsibilities.

Preliminary Findings

1. Social science research needs UNESCO because of the links it provides to researchers and facilities world-wide and because most other international mechanisms are weak and underfunded. At the same time, there is need for significant reforms in the focus, direction, and management of UNESCO social science activities. If the U.S. withdrawal is carried out, it will be particularly important to earmark sufficient resources, about $1 million, through the National Science Foundation--and possibly to channel them through the National Research Council, the Social Science Research Council, and the Consortium of Social Science Associations in support of international cooperative social science research and training activities. Failure to do so would represent a serious setback for an already precarious international social science research environment.

2. There has been minimal involvement of the U.S. social science community in UNESCO projects. If the United States withdraws, interested scholars would still be able to obtain UNESCO publications and attend meetings on an individual basis.

3. There would be negligible impact on current U.S. research interests, but perhaps potential problems with future access to field sites in certain countries. Furthermore, a U.S. withdrawal from UNESCO would result in the absence of a U.S. voice in determining the substantive content and future directions of UNESCO social science activities.

4. Although UNESCO projects are a unique and important source of support to developing country interests, there are reservations about the quality of research and training activities, particularly the emphasis on "indigenization," which veers toward ideology. The UNESCO program in support of Third World social science research would be harmed by the loss of U.S. funding.

5. It is important to ensure that the full subvention currently provided by UNESCO to the International Social Science Council is maintained.

6. There are poor possibilities for alternative interim arrangements for supporting these UNESCO-related projects through multilateral channels. On the other hand, enhanced bilateral funding may facilitate new and better opportunities for collaborative research, particularly in the developing world.

MAJOR PROGRAM IX:
SCIENCE, TECHNOLOGY AND SOCIETY

Relations; S&T Policies
(IX.1 and IX.2)

Assessment/Potential Impacts

Subprogram areas IX.1 and IX.2 provide support for a variety of activities directed toward the development of science and technology policy structures and instruments for policy analysis of particular interest to developing countries. There has been concern with respect to the value of some of these efforts. The current annual UNESCO budget for Major Program IX (projects and staff costs) plus overhead is approximately $6.2 million--the U.S. share would be $1.6 million. Restricting attention to program costs ($3.8 million), the U.S. share would be about $960,000 per year. Other sources of support in this area provide a total of $1.7 million per year, or somewhat less than one half of the regular UNESCO program.

The level of visibility of the Program on Science, Technology and Society, and the extent of U.S. participation in it, are perhaps the lowest of any of the programs supported within the UNESCO science budget. A number of U.S. academicians and science policy administrators contacted in connection with this evaluation either had never heard of the program or were only vaguely aware of <u>some</u> of its components. In general, the activities undertaken through this program

would appear to be marginal to the interests of both the U.S. government and academic community.

Part of the reason for this low level of interest and involvement is that, unlike most of the other major elements of the UNESCO program, which are mostly disciplinary-based, there is only a very limited constituency for this activity. The subject is of some general interest to governments of developing countries and to the limited academic community concerned either with the planning of science and technology (S&T) policy or with the impact of S&T on society and particularly on economic development. For this reason, the United States derives little direct advantage from participation, except to the extent that it finds it useful to promote better S&T planning and application in the Third World.

The science, technology, and society program was among the earliest initiated by UNESCO, and it is closely associated with those Americans who were involved in the creation of the UN organization at the end of World War II. More recently, the science policy development theme has been criticized as too theoretical and not applied enough to the needs of the Third World. There is also some competition between UNESCO's science policy effort and the work of other multilateral bodies such as the Organisation for Economic Cooperation and Development (OECD) Committee for Science and Technology Policy.

Because the work undertaken within this program is comparatively marginal to U.S. interests, there will be few substantial negative consequences from withdrawal. One negative outcome may be the loss of cross-national knowledge about the science policies of other governments outside the OECD framework. Moreover, to the extent that the United States wishes to influence other governments to adopt its approaches to the development of S&T infrastructure and science policy, an avenue of contact would be closed off.

As a nation at the leading edge of S&T innovation, the United States is at least as concerned about the impact of science and technology on society as any other developed country. To the extent that this concern involves the need to enter into global dialogue with other technologically advanced countries and concerned developing countries, the U.S. withdrawal would deprive this country of one of the international forums available for analysis and discussion of these matters.

Although the Science, Technology, and Society program is of relatively minor consequence in comparison with other UNESCO activities, there are both symbolic and functional benefits to be derived by the United States from remaining a part of this program. At the symbolic level, there is the fact that the United States has had a historical commitment to the activity since the earliest days of UNESCO. Moreover, improving the S&T capabilities of developing countries has been (and remains) a primary development goal of the current administration. A U.S. withdrawal, if uncompensated with other initiatives, could appear to send a mixed message to developing country governments.

The other symbolic value of continuing support for this program has to do with its potential foreign policy benefits. UNESCO offers an opportunity to interact with scientists from countries where contacts with the West are limited only to official channels, and where informal

contacts and bilateral relations with the United States are not a current possibility.

On another level, the U.S. museum world has derived benefit from the advisory and consultative function that UNESCO has performed. The U.S. academic community also has benefited from some of the research projects supported under this UNESCO program, including an effort to develop a cross-national typology of science policy issues.

Alternatives

There are certain other UN organizations that could engage in enhanced science policy activities. These include the UN Center for Science and Technology for Development (UNCSTD), which has already focused on some of these issues, and the UN Development Program (UNDP).

The United States could also enhance its participation in multilateral and bilateral associations outside the United Nations. For example, OECD already is engaged in some of the same type of science policy work of concern to UNESCO, although it focuses primarily on policies of its member states. The UN Economic Commission for Europe (ECE) carries out similar work, and other regional organizations such as the Organization of American States (OAS) or the Association of South-East Asian Nations (ASEAN) could also expand their efforts in this area.

The United States, primarily on a bilateral basis, is already involved in cooperative research or action projects related to science policy and the impact of science and technology on society. Projects on the former are supported or conducted by the Agency for International Development and the National Institutes of Health, and on the latter by the National Science Foundation. These programs could be expanded. Another possibility would be working with developing country associations, such as ASEAN, which are involved in technical cooperation.

Finally, there are possibilities that NGO channels might be utilized to promote further work on the development of science and technology infrastructure. For example, the role of the International Council of Scientific Unions (ICSU) could be expanded to include a greater focus on the problem of building scientific infrastructure and coherent science policies in developing countries. In a similar fashion, intellectual attention to the impacts of science and technology on society could be promoted through formal or informal networks that include private foundations and academic centers of excellence with an interest in the problems both here and abroad.

Future funding of these potentially valuable activities will involve new institutional arrangements. With respect to those projects having to do with science policy and/or S&T infrastructure in developing countries, the U.S. Agency for International Development--which already has similar work ongoing--would represent the appropriate venue with possible collaborative arrangements with the National Research Council; particularly its Board on Science and Technology for International Development (BOSTID). In the case of the science, technology, and society projects, the professional oversight responsibility is less

obvious, but it may be possible for the NSF Directorate on Scientific, Technological and International Affairs (STIA) to assume responsibility for grantmaking and oversight in this area in collaboration with non-governmental organizations, for example, professional societies and the American Association for the Advancement of Science (AAAS).

In consideration of the resources currently provided these activities and drawing on results in the present review, it is recommended that funding on the order of $750,000 per year be provided overall for Program IX--Science, Technology, and Society activities under the oversight of a U.S. body sensitive to U.S. interests.

Preliminary Findings

1. It is difficult to make a convincing case that the UNESCO program on Science, Technology, and Society occupies a central role either in the operation of UNESCO itself or in the scientific and technological affairs within or between countries. Some of the activities are undoubtedly worth preserving, since they are also a part of the ongoing agenda of other organizations.

2. The current program must be judged relatively marginal to U.S. concerns and therefore deserving of support only insofar as it can be focused efficiently and appropriately on science policy directions and on the development of infrastructures responsive to the needs of developing countries.

3. With respect to a U.S. withdrawal from UNESCO, there might be some loss in learning about scientific policy trends in the developing world, as well as in the opportunity to influence developments. There has been some benefit from UNESCO work on developing a cross-national typology of science policy issues. On the other hand, there has been criticism that much of the UNESCO science policy work is too theoretical.

4. Regional science meetings at the ministerial level can be useful to developing countries by enhancing the prospects for a follow-up and by providing a forum for interaction with the global scientific community. However, such meetings at the European/North American level are of marginal value.

5. Alternative interim arrangements for supporting science policy projects through multilateral channels are feasible (e.g., OECD, ECE, OAS, ASEAN). It is proposed that funding be provided to an appropriate U.S. organization sensitive to U.S. interests (e.g., NSF, AID, NRC) that could support international science policy activities through professional societies and universities.

MAJOR PROGRAM X:
THE HUMAN ENVIRONMENT AND TERRESTRIAL AND MARINE RESOURCES

The Earth Sciences Program
(X.1 and X.2)

Assessment/Potential Impacts

The earth sciences program of UNESCO is of reasonably high quality. The program is organized into a manageable number of discrete, focused projects, which are pursued in an essentially nonpolitical and scientifically competent manner. Program X.1 (The Earth's Crust and its Mineral and Energy Resources) and X.2 (Natural Hazards) are administered by the UNESCO Division of Earth Sciences with an annual combined project cost of $1.4 million; total annual cost of the program, including staff and overhead, is slightly over $5 million. These funds are supplemented by funds from sources outside of UNESCO that total annually about $2.3 million. The U.S. portion of support of the program is about $1.3 million. A significant number of programs in this area are of direct interest and concern to the American scientific community.

The major activity under subprogram X.1 is the International Geological Correlation Program (IGCP), which is unique in its joint sponsorship since 1973 by UNESCO and the International Union of Geological Sciences (IUGS), a nongovernmental organization. About 80 countries now actively participate in the IGCP. As a continuation of a program initiated by the IUGS in 1969 largely due to the efforts of U.S. earth scientists, the IGCP was established to provide a means to formulate worldwide correlations among geological strata. Since that time, the program has been broadened to include other kinds of geological research. Participation by U.S. geologists remains prominent.

More than 300 U.S. scientists are involved in the roughly 50 IGCP working groups that exist at any given time; U.S. scientists have served as leaders of about a dozen projects, with another 30 or so projects having U.S. members serving on international steering committees. U.S. scientists have served continuously on the IGCP Board and its Scientific Committee. U.S. participation has three principal aspects: (1) project activity including scientific research, symposia, field conferences, and the preparation and production of geological maps and reports; (2) Scientific Committee and Board activity, including the provision of expert advice in program development and planning; and (3) support for conferences on earth science topics that might lead to IGCP projects. U.S. participation reflects a combination of governmental/nongovernmental representation, which stems from joint sponsorship and the fact that access to foreign lands requires and involves government agencies and personnel.

While it is anticipated that U.S. representation will continue on both the IGCP Board and the Scientific Committee,* this is by no means

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*U.S. Department of State Memorandum of Law, December 16, 1983.

totally assured. Appointments to the 15-member Board are made by UNESCO in consultation with the president of the IUGS; the Union apparently does have the final say in the appointments to the Scientific Committee. At the end of 1984, the term of the U.S. representative on the IGCP Board will expire. It is assumed that the United States will be asked to nominate a replacement. In fact, the entire leadership of the Board (chairman and the two vice-chairman) will be changing. It will be important for the future direction of the program that qualified persons be appointed.

There is some question as to how well U.S. scientists will be received in UNESCO earth sciences projects following withdrawal. Will U.S. ideas for new projects be approved? Will non-U.S. project leaders continue to seek the involvement of U.S. geologists? These questions cannot be answered at this time, but they are sources of concern among U.S. earth scientists. Even if the short-term answer was positive, in the long term, U.S. withdrawal from official membership in UNESCO could gradually reduce U.S. involvement in IGCP and other components of Program X.1 (e.g., data/mapping activities). Loss of U.S. scientific contributions to the program will inevitably reduce its quality and could have an adverse effect on interactions with Third World colleagues in particular. Over the past 10 years, the IGCP has provided a significant vehicle whereby scientifically valid global research projects are initiated, organized, and supported. Particularly helpful has been the possibility of engaging the cooperation of science communities and governments in Third World countries under the UNESCO flag. The IGCP projects provide useful international contacts for U.S. scientists that may not be available on a bilateral basis or through purely nongovernmental forums.

There are other elements to the UNESCO earth sciences program as well as the IGCP. For example, U.S. scientists have been active in developing new initiatives in the areas of mineral deposit modeling and remote sensing. Without official membership in UNESCO, U.S. association with these activities will have to be via the IUGS route, insofar as UNESCO utilizes the Union in program planning and development. The land-use planning activity is potentially an important one; the IUGS Research and Development Board has developed some specific suggestions for projects in this area. The work of the Lithosphere Commission (ICL) is of high interest to U.S. scientists, and the recent UNESCO General Conference action to increase support of the lithosphere program was warmly received. Publication of data and maps is another area of high interest to U.S. geologists and one in which U.S. participation is important. Finally, in the area of training, the U.S. geological community could be much more actively involved than it has been. U.S. expertise in map production and resource assessment are just two areas in which U.S. input is sought by colleagues in other parts of the world. Thus, there are several non-IGCP areas of the UNESCO earth sciences program in which U.S. geologists either are or could be usefully involved.

The natural hazards program (subprogram X.2) is a technically competent activity from which the U.S. scientific community benefits. U.S. scientists have participated actively in the work of the UNESCO

International Advisory Committee on Earthquake Risk and its regional subcommittees. The UNESCO program provides an opportunity for U.S. earth scientists to visit hazard-prone areas, study and evaluate disaster patterns and risks, and aid in the development of mitigation techniques, which could have a potentially beneficial domestic use. In the absence of formal U.S. membership in UNESCO, U.S. involvement in the natural hazards program is bound to decline, particularly since the program is exclusively under UNESCO management. U.S. ability to observe hazards assessment and mitigation activities under UNESCO auspices in other countries and to participate in information exchange programs might also prove to be more difficult.

In terms of program management, the earth sciences activities are not immune to the bureaucratic cumbersomeness that characterizes UNESCO activities in general. There is frustration at the comparatively small amounts of money that are available for actual project work as opposed to administration. Moreover, there is evidence that those programs with a strong scientific advisory mechanism, such as IGCP, tend to be of higher scientific quality than those solely directed at the staff level.

Alternatives

It is difficult, if not impossible, to identify a single alternative organization, either intergovernmental or nongovernmental, through which to channel resources to permit continued U.S. association with UNESCO earth sciences programs. There are many organizations doing important work in international geology and natural hazards. This report, however, has focused on identifying channels that provide association with present UNESCO activities. Three intergovernmental organizations involved in various aspects of the UNESCO earth science program--the United Nations Environment Program (UNEP), the International Atomic Energy Agency (IAEA), and the United Nations Disaster Relief Organization (UNDRO)--are specifically mentioned in the program and budget document. About a dozen nongovernmental bodies are also mentioned, the majority of which have some formal or informal linkages to organizations associated with ICSU.

Since it is expected that the United States will retain its formal membership in the IGCP, it may be possible to utilize the Funds-in-Trust arrangement to continue U.S. support for this program. On the other hand, the funds could be provided directly to IUGS. Perhaps the Union would also be willing to serve as an alternative channel for supporting other earth science activities. Earmarking funds for international organizations, whether intergovernmental or nongovernmental, would require a U.S. management mechanism such as the U.S. Geological Survey (USGS) of the Department of the Interior. This would be particularly important in the first year of nonmembership in UNESCO to facilitate the transition to a different support system.

In summary, a preferred option would involve a combined approach of direct support to UNESCO to compensate for loss in program support (including overhead at a level presumably to be negotiated), plus

support of the principal cooperating intergovernmental or nongovernmental bodies on the recommendation of a U.S. agent. Another approach is to invite one or more of the cooperating bodies, such as IUGS, to serve as the channel for the totality of funds involved. Details of program management and accountability would have to be worked out, as well as procedures for coordinating work with UNESCO. In both of the options, a strong U.S. focal point is necessary to provide guidance and oversight. A further option is to provide the totality of funds involved directly to a U.S. agent as, for example, USGS, for disbursement to these international programs, or in general support of the objectives of the programs, through whatever vehicle--multilateral or bilateral--is considered most appropriate. If this route is chosen, care must be taken not to dwarf the contributions of other countries. A total U.S. contribution of $2 million per year is suggested for the earth sciences area.

Preliminary Findings

1. The earth sciences programs are of reasonably high quality, and some mechanism should be found to continue to support them during this interim period. Those programs such as the IGCP, which are focused more on the advancement of science, tend to have higher U.S. participation than those concerned with training and education.

2. There is no single intergovernmental organization that can be identified as an appropriate alternative for the totality of the earth sciences program. As far as the IGCP is concerned, it is anticipated that the United States will retain its membership; therefore, a direct contribution to UNESCO through a trust fund arrangement is suggested. However, in the UNESCO budget the IGCP program represents only about 30 percent of the total program within subprogram X.1 and, in addition, there is the natural hazards program to consider (X.2). The cooperating organization with the broadest range of compatible interests is the nongovernmental ICSU union, the International Union of Geological Sciences (IUGS). The Union may be willing to serve as a channel for U.S. funding, but this will require a period of negotiation to determine their interest in such a role and to identify any constraints that may exist.

3. Programs such as the IGCP, interdisciplinary research on the earth's crust, data/mapping, and earthquake risk are considered especially successful. One of the reasons for this is the involvement of the concerned professional communities through nongovernmental organizations. Programs that have an active, expert advisory mechanism tend to be of higher quality than those that do not.

4. Earmarking a portion of the funds to enhance U.S. backstopping is absolutely essential. Increased management responsibilities can be anticipated no matter which alternative is utilized.

MAJOR PROGRAM X:
THE HUMAN ENVIRONMENT AND TERRESTRIAL AND MARINE RESOURCES

Water Resources
(X.3)

Assessment/Potential Impacts

Subprogram X.3, Water Resources, covers implementation of the third phase of the International Hydrological Program (IHP-III). It is concerned with establishing the scientific bases for the rational management of water resources. Particular attention is being devoted to the problems of arid and semiarid regions and of humid tropical regions. This program is closely related to subprograms X.2 (Natural Hazards), X.5 (Coasts and Islands), and X.6-9 (MAB activities). The annual budget for the Water Resources Program (projects and staff costs) plus overhead is about $4.4 million--the U.S. share would be $1.1 million. Restricting attention only to program costs ($2.7 million per year), the U.S. share is about $700,000 per year. Support for program activities from other sources, primarily UNDP, total $2.9 million per year, or somewhat larger than the regular UNESCO program.

U.S. scientists have played leading roles in the establishment, implementation, and planning of the International Hydrological Program. The program is structured around four major headings: (1) Hydrological Processes and Parameters for Water Projects; (2) Influence of Man on the Hydrological Cycle; (3) Rational Water Resources Assessment and Management; and (4) Education and Training, Public Information, and Scientific Information Systems. Eighteen themes and a multitude of projects and subprojects engage scientists, technicians, and decision makers in cooperative national, regional, and multilateral activities directed toward the rational management of water resources. The current phase, IHP-III, is directed toward pragmatic application of water resource management information by users through pilot/demonstration projects. Considerable emphasis is now being devoted to technician-level training to complement university and postgradauate training programs.

The IHP Program is guided by a 30-member Intergovernmental Council charged with establishing the program, evaluating it, recommending scientific projects, and coordinating international cooperation among member states, inter alia. A bureau of the Council works with the UNESCO Secretariat in ensuring the execution of its program in accordance with decisions of the Council. The United States has been represented on the Council and bureau since their formation. National committees in participating member countries form the network for program coordination and cooperation among projects--it is expected there will be 130 participating national committees in IHP-III by 1985. This shows the extensive multilateral collaboration at the base of the International Hydrological Program. There is considerable and necessary interaction with the scientific interests of other intergovernmental and nongovernmental organizations. UN specialized agencies involved include FAO, WHO, IAEA, the regional economic commissions and particularly WMO. The scientific content and significance of IHP program

definition, implementation, and achievement are essentially linked to nongovernmental organizations, particularly the International Association of Hydrological Sciences (IAHS), the International Association of Hydrogeologists (IAH), and the Scientific Committee on Water Research (COWAR) of ICSU. It is through these nongovernmental professional associations that the IHP Council is provided scientific and technical advice and guidance in undertaking complex studies and demonstration projects. They also provide important guidance on training and infrastructure development.

One should keep in mind that the IHP has been conceived as a long-term program with results potentially beneficial to all countries, particularly those in regions of the world experiencing grave water resource problems. The United States has benefited from this UNESCO-sponsored program through enhanced technical interactions with many countries and regions of the world where such contacts would have been difficult on a bilateral basis. UNESCO, as an intergovernmental organization, has facilitated these contacts among scientists. These interactions, including the significant technical contributions of U.S. scientists to the solution of problems elsewhere, may be increasingly restricted as a result of the U.S. withdrawal from UNESCO. In the short term, withdrawal may have only limited impacts on U.S. participation in IHP, since it is likely that many U.S. scientists will continue to be associated with this program in their personal capacity. In the longer term, however, the lack of official association with this intergovernmental program involving more than 100 nations could have serious consequences on both U.S. scientific relationships abroad, as well as on the quality of the overall UNESCO program.

With nonmembership in UNESCO, the United States loses its place on the IHP Intergovernmental Council and on the bureau of the Council where the United States has played a critical planning and leadership role. It will be possible to provide some leadership through participation in nongovernmental organizations closely associated with IHP. Scientific bodies in certain other countries are also expected to provide useful liaison with scientific groups, projects, and program developments elsewhere.

Alternatives

In view of the importance of the IHP to the U.S. scientific community, support for this program at a level of $1 million per year (at a minimum) is suggested. This funding is based on the current level of U.S. contributions to the UNESCO-IHP. However, there are opportunities to enrich and significantly expand collaborative work in this program. Such possibilities are being considered by the U.S. National Committee on Scientific Hydrology housed at the U.S. Geological Survey (USGS). In any case, the alternatives considered here with respect to current multilateral IHP activities will require strengthened national management structures (including dealing with personnel ceilings) and funds to support the participation of U.S. scientists in IHP and other multilateral water resource program activities.

The IHP is an intergovernmental program involving over 100 nations, and UNESCO's role as an intergovernmental focal point is important. Interim alternative arrangements are:

Alternative Option 1: Specific program support to UNESCO (Funds-in-Trust, donations, etc.) to cover 25 percent of the regular annual budget plus 10 percent overhead ($750,000 per year). An additional $250,000 should be provided to the U.S. National Committee on Scientific Hydrology, to permit program oversight and to support participation of U.S. scientists in IHP programs.

Alternative Option 2: Provide the same level of financial support ($750,000) through ICSU and/or one of its associated bodies. This option would also require support for the US National Committee on Scientific Hydrology as noted above.

Alternative Option 3: Provide the same level of financial support ($750,000) through the U.S. National Committee on Scientific Hydrology to guide contributions to specific IHP multilateral activities through other governmental and nongovernmental organizations. An additional $250,000 would be required to support oversight as noted above.

Preliminary Findings

1. The International Hydrological Program (IHP), an important global activity involving nearly 130 countries, is concerned with the rational management of water resources. In the current third (5-year) phase, particular attention is being devoted to problems of arid and semiarid regions, and humid tropical regions. The U.S. has played a leading role in program planning and implementation.

2. The IHP is guided by a 30-member Intergovernmental Council on which the United States is represented. Withdrawal will result in a loss in membership on the Council and on the bureau of the Council. In the short term, there may be only modest impacts on U.S. interests and on UNESCO programs after U.S. withdrawal, since it is expected that U.S. scientists will continue to be associated with the IHP in their personal capacity, assuming that funding is available to ensure such participation. In the longer term, the lack of official association could have serious consequences.

3. There have been important benefits as a result of United States participation such as enhanced opportunities for technical interaction and participation in global observational projects. UNESCO as an intergovernmental organization has played a critical role in making this possible.

4. It is important that the United States maintain a strong management structure in support of U.S. participation. The U.S. National Committee on Scientific Hydrology of the U.S. Geological Survey, backed

up by advisory services from the nongovernmental community of hydrologists, can perform this function.

5. Because of the nature of the IHP and the role played by UNESCO, the simplest, most efficient interim alternative arrangement is to make maximum use of Funds-in-Trust, donations, etc., coupled with a strong nationally managed effort to enhance U.S. participation.

MAJOR PROGRAM X:
THE HUMAN ENVIRONMENT AND TERRESTRIAL AND MARINE RESOURCES

The Marine Sciences Program:
The Ocean and Its Resources;
Management of Coastal and Island Regions
(X.4 and X.5)

Assessment/Potential Impacts

UNESCO marine science activities cover a wide range of interests, including promotion of collaborative research; strengthening of national infrastructures concerned with ocean circulation, climate, fisheries, and marine pollution; and environmental management of islands and coastal zones. There are three major units of UNESCO involved in these activities: (1) the Intergovernmental Oceanographic Commission (IOC); (2) the Division of Marine Sciences; and (3) the Man and the Biosphere Program (MAB). Taken together, subprograms X.4 and X.5 have an annual budget (project, staff and overhead) of about $8.8 million, of which the U.S. share is about $2.2 million. Restricting attention to program costs (project, plus staff), the total annual expenditure is about $5.5 million, of which the U.S. share is about $1.4 million. Support for program activities from other sources, such as UNDP and UNEP, totals slightly less than $4 million annually, which is a significant contribution to the overall UNESCO effort devoted to marine sciences. About half the project costs are associated with activities that are primarily scientific in character and are of particular interest to U.S. research interests. The United States is interested in all UNESCO efforts devoted to the effective strengthening of national and global capabilities concerned with the topics covered by X.4 and X.5 program activities.

About half of the resources available for X.4 and X.5 activities are administered by the IOC secretariat. The overall purpose of the IOC, an autonomous body established within UNESCO in 1960, is to promote the development of marine sciences through international collaboration. The IOC facilitates scientific planning and program coordination, assists scientists in member states to participate in international marine science programs, promotes exchange of oceanographic data, and sponsors education and training activities in marine science and technology to enhance the national capabilities of the developing countries. In recent years, the interests of the developing world have received increased attention in the work of IOC. In the view of some

U.S. marine scientists, this has resulted in less attention to issues of science and more to political/organizational topics. There is also some question pertaining to the management capabilities of the IOC, which are made more complex by the overall UNESCO bureaucracy.

About one third of the resources of X.4 and X.5 programs are administered by the Division of Marine Sciences, which has interests closely linked to the IOC. The Division has done a good job in providing training and specialized advisory services for developing countries; increased attention needs to be devoted to this area to enable the developing world to participate more productively in international observational research. U.S. scientists have played important roles in assisting the division to carry out its responsibilities.

Finally, a significant portion of resources in the X.5 area are devoted to work on coastal island systems. These activities are managed by UNESCO components concerned with ecological and environmental problems coming largely under the purview of the Man and the Biosphere Program. The U.S. plays a strong leadership role in all these aspects of the marine science program through a combination of governmental and nongovernmental participation.

U.S. withdrawal from UNESCO may affect these three areas of concern in different ways. The United States plans to retain its membership in the IOC, an intergovernmental organization, even if the United States withdraws from UNESCO. This will preserve official U.S. participation in the only intergovernmental organization concerned solely with international oceanographic problems, broadly speaking. It will be necessary to work out the details of channeling financial contributions and professional staff support to the IOC, but no serious difficulties are foreseen. The support of and participation in the activities of the Division of Marine Sciences and of MAB are more complex.

The United States has an important agenda for international cooperative interactions in the marine sciences area. UNESCO provides one of the most important mechanisms for facilitating and promoting such cooperation. All three areas (IOC, Division of Marine Sciences, and MAB) need to be considered in assessing current activities, including the impact of a U.S. withdrawal from UNESCO, and proposing interim alternatives for enabling U.S. scientists to continue to participate in these activities.

Ihe Intergovernmental Oceanographic Commission (IOC). Three of the IOC activities are of particular concern to the United States: (1) the oceanic components of the World Climate Research Program (WCRP), (2) the Integrated Global Ocean Services System (IGOSS), and (3) the International Oceanographic Data Exchange (IODE).

The oceanographic aspects of the World Climate Research Program (WCRP) are of fundamental interest to the United States. The WCRP has as its objective the prediction on climate over periods of a few months to several decades. It is potentially one of the most economically important scientific programs being pursued by the United States. The United States is playing a leadership role in the WCRP, but active international cooperation among many countries is essential for its success. The oceanographic aspects of the WCRP are being planned

cooperatively by the Joint Scientific Committee of the International Council of Scientific Unions (ICSU) and the World Meteorological Organization (WMO) and by the Committee on Climatic Changes and the Ocean (CCCO) of the IOC and the Scientific Committee on Oceanic Research (SCOR) of ICSU. The activities of the CCCO are governed by an agreement between ICSU and UNESCO and a memorandum of understanding between IOC and SCOR.

The International Oceanographic Data Exchange Program is the only mechanism, for example, by which some oceanographic data are accessible to the many agencies in the United States that need these data. Data on subsurface ocean temperatures and salt content obtained by merchant and research ships of many nations are collected and transmitted through IGOSS. Many other IOC activities are also important to U.S. interests, although not at the same level as those highlighted above.

If the United States were to withdraw from IOC, it is conceivable that, over the course of time, alternative arrangements could be made for data exchange and planning for WCRP, IGOSS, and other programs. But this development of new arrangements would be costly in time and resources. The cooperation of many developing coastal states is essential for the world coverage demanded by the global nature of climate and ocean circulation. Without our continued membership in IOC, such cooperation would be difficult to enlist.

Division of Marine Sciences. The complementary activities of the Division of Marine Sciences provide considerable investment of resources through UNESCO regional offices for strengthening national infrastructures and training of scientific and technical personnel for enhancing marine science research programs and the study of ocean resources. Other important activities of this division are directed toward the rational management of marine systems and particularly studies on the marine environment and the continental margin involving close collaboration with ICSU and its associated bodies as well as several specialized agencies of the UN system. The division also disseminates research results and scientific information in the marine sciences through documents, reports, and a newsletter. With respect to coastal and island systems, the division supports a number of inter-disciplinary research projects on the productivity of coastal regions and studies pertaining to rational and integrated management of such zones.

Man and the Biosphere (MAB) Program. The major UNESCO support of MAB activities falls in subprograms X.6-X.9. There are also important contributions within subprogram X.5 pertaining to the management of coastal and island regions as they fall within theme 5 of the MAB program. This is particularly true of the activities related to integrated management of islands and coastal zones. Considerable attention is directed to the training of specialists.

All of the marine science areas could benefit from more efficient overall management and increased reliance on the competencies of other bodies such as WMO and particularly ICSU and its associated bodies for substantive input. Furthermore, the marine area has become increasingly preoccupied with development issues that are important in their own right but divert the focus from scientific objectives. International marine science would benefit more from being housed in a division or organization whose mission was purely or predominantly scientific than the current UNESCO institutional mix.

In the short term, there would probably be limited impact on U.S. and UNESCO science interests of a U.S. withdrawal from UNESCO provided there is continuity in funding to enable U.S. scientists to continue to participate in the activities discussed above. The United States would maintain its membership in IOC and pay its dues through the IOC Trust Fund. Other marine science and MAB interests can perhaps be maintained though U.S. associations with NGOs and the participation of individual scientists in UNESCO-sponsored activites. However, in the longer term, depending on the effectiveness of interim alternative mechanisms, these programs might be harmed.

Alternatives

The most efficient and effective mechanism for interim alernative support is to make maximum use of direct contributions to UNESCO (Funds-in-Trust, donations) for the current level of program (projects and staff) costs. Additional resources are recommended for oversight and international research activities to be administered by an organization that is sensitive to U.S. interests, e.g., NSF, with the assistance/advice of the interagency Panel on International Programs and International Cooperation in Oceans Affairs (PIPICO), and the NRC Board on Ocean Sciences and Policy (BOSP). In the augmented IOC program that PIPICO has proposed, it is hoped that consideration will be given to much greater participation of ICSU and its bodies as well as other governmental organizations. In any case, it is important to maintain the current level of Division of Marine Sciences and MAB activities contained in subprograms X.4. and X.5. USMAB is proposed as a body to oversee some of these activities.

A U.S.-supported international marine sciences program related to subprograms X.4 and X.5 is proposed at a level of $2.5 million--$1.4 million as a contribution to UNESCO (Funds-in-Trust, donations, etc.) and $1.1 million to be administered by U.S. organizations sensitive to U.S. interests (e.g., NSF/PIPICO and BOSP, and USMAB). Alternatively, the totality of available resources could be administered by NSF/PIPICO and USMAB, making full use of the capabilities of nongovernmental organizations and their U.S. advisory mechanisms.

Preliminary Findings

1. UNESCO provides one of the most important mechanisms for facilitating and promoting international cooperative interactions in the marine sciences. Current activities cover a wide range of interests of importance to the U.S. marine science community. About half of these activities are primarily scientific in character, while the remaining pertain to strengthening infrastructures through advanced training and advisory services to meet the needs of the developing world. Some concern has been expressed about the wisdom of merging these two program objectives.

2. Marine science activities contained in subprograms X.4 and X.5 are administered under three functional components: about one half by the Intergovernmental Oceanographic Commission (IOC), one third by the Division of Marine Sciences, and the remaining portion pertaining to coastal island systems as part of the Man and the Biosphere Program (MAB). A U.S. withdrawal from UNESCO will affect these three functional areas, all of importance to the United States, in different ways.

3. The United States intends to maintain its membership in the IOC and will be able to profit from the unique collaborative interactions provided by that organization. It is important that the current level of U.S. support of IOC programs be maintained through contributions to the IOC Trust Fund, augmented by a nationally-managed program.

4. It is equally important to maintain the current level of Division of Marine Sciences and MAB activities contained in subprograms X.4 and X.5. On withdrawal from UNESCO, the United States would only be able to provide substantive guidance to these activities indirectly through its participation in NGOs associated with these programs. Financial contributions could be provided to UNESCO (Funds-in-Trust, donations, etc.) and to NGOs via a U.S. agency sensitive to U.S. interests, such as NSF (including the advice of PIPICO amd BOSP) and USMAB.

MAJOR PROGRAM X:
THE HUMAN ENVIRONMENT AND TERRESTRIAL AND MARINE RESOURCES

Environmental Sciences: Man and the Biosphere Program (MAB) (X.6-X.9)

Assessment/Potential Impacts

This section focuses on the subprogram areas (X.6-9) largely having to do with practical problems of natural resource management, which is the thrust of the MAB program. As noted above, portions of X.5 dealing with management of coastal and island regions are closely linked to the MAB program and objectives. The annual budget for programs X.6-9 (projects and staff costs) plus overhead is about $7.4 million--the U.S.

share is about $1.85 million. If one considers program costs only ($4.5 million), the U.S. contribution would be $1.25 million per year. Support for program activities from other sources is about $4.25 million per year, which is of the same order of magnitude as regular program costs.

Subprograms X.6-9 are being considered together since they form the core of the MAB program, which was extensively assessed on its tenth anniversary in 1982. The objectives of this program are (1) the general study of the structure and function of the biosphere and its ecological regions to provide an improved environmental information base for decision making; (2) systematic observation of changes brought about by man in the biosphere in order to provide new tools for environmental planning and resource management; (3) the study of the effects of these changes upon human populations to improve our ability to predict these effects and to develop new strategies to ameliorate the disruption of human lives; and (4) education of the public and the dissemination of information needed by decision makers and scientists. The initial MAB program is divided into 14 project areas to focus research efforts and facilitate coordination; half deal with particular kinds of geographic areas or ecosystems, the other half with impacts and processes such as conservation, demographic change, environmental perception, and pollution.

U.S. scientists have played leading roles in the planning, establishment, and implementation of the MAB program as well as of its predecessor, the ICSU-sponsored International Biological Program (IBP). This has been at both the governmental and nongovernmental levels. Since the creation of MAB, the United States has been represented on the 30-member International Coordinating Council, which guides the scientific content of the overall program, and has also held one of the four vice-presidencies of the MAB Bureau at all times. In addition, U.S. science administrators have been seconded to the UNESCO MAB secretariat until 1982 when U.S. agency cutbacks made this no longer feasible. There have been many hundreds of U.S. researchers actively engaged in MAB sponsored activities--national, bilateral, and multilateral projects. A small, yet effective, USMAB secretariat, currently located in the OES Bureau of the State Department, facilitates U.S. participation in MAB activities and serves the U.S. National Committee for MAB, which is charged with guiding and overseeing U.S. interests in national and international MAB projects. The U.S. Forest Service of the Department of Agriculture and the Park Service of the Department of the Interior have been particularly supportive of USMAB.

The UNESCO MAB secretariat and UNESCO as an intergovernmental organization have played vital roles in coordinating and facilitating the development of national projects and cooperative international interactions among research groups having common interests and problems. Participating nations have formed national committees to establish priorities and promote funding in support of projects. UNESCO has been instrumental in assisting the formation of these national committees and national programs as well as international cooperative arrangements; there are now some 105 functioning national committees. With the successful advent of integrated approaches to

natural resource management needs, the International Coordinating Council agreed to concentrate on four areas: (1) the humid tropics, (2) the arid and semiarid zones, (3) urban systems, and (4) conservation. These developments and the leadership of the secretariat have been appreciated by governments and were especially underscored at the fall 1983 session of the UNESCO General Conference.

Because of the integrated, interdisciplinary nature of the MAB program and the broad range of interests of UNESCO, UNESCO has been able to foster the active collaboration of natural and social scientists and has facilitated contact among researchers. There is fruitful exchange with the USSR in the area of assessing long-term effects to the environment in the context of the Biosphere Reserve Program. Important work is moving ahead on assessing problems in the arctic region. Serious problems of desertification and resource management in the Sahel and similar regions elsewhere in the world have received increased attention. The MAB program and framework are of considerable value to the United States as well as other countries in defining problems and facilitating integrated cooperative approaches to solutions. UNESCO provides an intergovernmental mechanism to structure collaborative arrangements designing future complex global observational programs involving ecological, geological, and behavioral processes. A proposed activity related to enhanced understanding of changes in the global environment is currently being considered by ICSU and affiliated nongovernmental scientific unions for possible implementation during the 1990s; a cooperative role with UNESCO and other U.N. agencies is envisaged.

There have been serious problems, on the other hand, with UNESCO program management--not so much of a political nature but rather of bureaucratic sluggishness and ineptness in defining and delegating authority. There are signs that some of the difficulties are moving toward correction through a recent reorganization of staff responsibilities. Still, there is a need to streamline administrative procedures and to clarify and strengthen the role of the MAB Bureau in serving the scientific objectives of the program. This situation will require monitoring.

There have been problems on the U.S. side with respect to staffing and funding USMAB needs. Previously, the USMAB secretariat was housed in the U.S. National Commission for UNESCO and was reinforced by staff detailed from several federal agencies. Contributions, also from different agencies, provided a common fund from which USMAB activities were supported. However, a budgetary crisis developed in early 1983 which adversely affected USMAB funding and secretariat support. There are currently (summer 1984) signs that some of these difficulties may be in the process of being overcome with increasing interagency involvement in MAB activities and the intention of the Department of State to put funding and staff support on a more permanent basis through budgetary action. Identification of USMAB program activities budgeted at a level of $2 million per year plus supporting secretariat staff costs are basic needs. Consideration of the impacts of a U.S. withdrawal from UNESCO and the examination of interim alternative arrangements for MAB are rather academic questions if the USMAB situation is not resolved satisfactorily and on a longer-term basis.

The impacts of a U.S. withdrawal from UNESCO can be examined on a short- and long-term basis. In the short term, there would probably be minimal disturbance or effect on MAB activities--many of these are national projects or are being carried out through bilateral arrangements. The serious problem in this case is securing national support and funding continuity. In the long term, however, the problems are potentially serious. First, the United States would lose its ability to provide a vice-president on the international MAB Bureau as well as its position on the Coordinating Council. This means that the United States loses its leadership role in guiding and overseeing the international MAB program. Second, the United States would lose its official ability to interact with other MAB national committees although the UNESCO MAB secretariat might well continue to facilitate informal collaborative efforts. Even so, the extensive U.S. efforts, which have often involved substantial cooperation with other countries and significant direct support from UNESCO, could be endangered. Third, the official designation by UNESCO of biosphere reserves (there are some 40 reserves in the United States) could be compromised in the long term. It is possible that the extensive state and local, as well as national, resources currently provided these activities could be put in competition with other needs and that the commitment to maintain these reserves for long-term research purposes would be diminished. Certainly, cooperative interactions with other countries would become more complicated. Fourth, the United States would lose the international MAB mechanism to examine, promote, and assist the implementation of new observational programs. It would be hoped that the UNESCO MAB secretariat would facilitate USMAB involvement in longer-term programs. Finally, there is the reverse question concerning the effect on the UNESCO MAB program of a U.S. withdrawal. In the short term, U.S. scientists might be invited in their personal capacity to continue to provide leadership and guidance to specific MAB projects by the UNESCO secretariat. However, in the long term, the lack of official U.S. participation and provision of scientific leadership could seriously cripple international MAB unless suitable alternative means are found to involve the U.S. scientific community.

Alternatives

Taking into account the current level of U.S. contributions to UNESCO programs and the nature of multinational activities, an overall international program on the order of $2 million per year provides the basis for considering alternatives. This international program is distinct and above support requirements for a U.S. national program that has been proposed at about the same order of magnitude.

For the reasons noted above, there is no real alternative to UNESCO for administering the MAB program in the sense of designating another governmental or nongovernmental organization. There are over 100 nations participating in international MAB activities through UNESCO; the question of charging UNEP or an ICSU body to administer MAB would have had to be addressed at the time of establishing MAB. Therefore,

interim alternatives are proposed, the most efficient and effective one being maximum use of direct contributions to UNESCO (Funds-in-Trust, donations, etc.) backed up by USMAB-managed activities.

A second alternative would emphasize considerable project management by USMAB or some other body sensitive to U.S. interests. In both cases, there would be active involvement of nongovernmental organizations such as ICSU, including the International Union of Biological Sciences (IUBS) and the ICSU Scientific Committee on Problems of the Environment (SCOPE), and the International Union for the Conservation of Nature and Natural Resources (IUCN). Both alternatives include seconding a top-level U.S. science administrator to the UNESCO secretariat to provide substantive input and links to peer participation assuming agreement by UNESCO. Both alternatives also include significant managerial and overhead costs, although the second would certainly be higher. Funds must be earmarked in both alternatives to encourage innovative projects by U.S. investigators for multilateral exploratory work in fields related to MAB interests, such as the longer-term elaboration of a program on global change. For example, it is recommended that consideration be given to supporting the further development of the International Satellite Land-Surface Climatology Project cosponsored by the Committee on Space Research (COSPAR) of ICSU and the International Association of Meteorology and Atmospheric Physics (IAMAP). In all cases, a particularly sensitive matter pertains to ensuring the continuity of funding for scientific work over time--an "on/off" situation would be detrimental to all parties concerned.

In summary, interim alternatives for this overall MAB-related program area are as follows:

Alternative Option 1:

(1)	Funds-in-Trust, contribution (including overhead) for selected X.6-X.9 activities	$ 900,000/yr.
(2)	Secondment of U.S. science administrator, plus support services, to UNESCO staff	150,000/yr.
(3)	USMAB-administered X.6-X.9 activities, new initiatives, oversight/management costs	950,000/yr.
	TOTAL	$2,000,000/yr.

Alternative Option 2:

(1)	USMAB-administered program directly related to ongoing international MAB, new initiatives, oversight/management costs	$1,850,000/yr.
(2)	Secondment of a U.S. science administrator, plus support services, to UNESCO staff	150,000/yr.
	TOTAL	$2,000,000/yr.

Preliminary Findings

1. The Man and the Biosphere Program and related projects in Major Program X, concerned with integrated approaches to natural resource management, include activities that are valuable to the U.S. scientific community. The International Coordinating Council provides scientific guidance to the overall program, which is currently concentrated in four areas: the humid tropics; arid and semiarid zones; urban systems; and conservation.

2. The United States, which has provided leadership throughout the existence of MAB, will lose its official capacity to be a member of the Coordinating Council and Bureau of Officers. There may be limited impact on MAB activities in the short term assuming funds are provided to both UNESCO and USMAB in support of ongoing projects. However, there could be serious consequences in the longer term to both the United States and international MAB programs if suitable interim alternative mechanisms cannot be worked out to ensure active U.S. participation and association.

3. Because of the integrated, interdisciplinary nature of the MAB program and UNESCO's broad range of scientific interests, UNESCO has played a unique role of fostering collaboration of natural and social scientists, and coordinating the interactions of scientific groups in 105 participating countries. There is no real alternative to UNESCO in carrying out these responsibilities. There have been, on the other hand, serious management problems in UNESCO that may be in process of improvement--a situation that needs to be monitored.

4. It is of fundamental importance to put the USMAB program on a sound footing in terms of continuity of funding and staff support. Consideration of the impacts of U.S. withdrawal from UNESCO and this examination of interim alternative arrangements are academic questions if the current crisis facing USMAB is not resolved satisfactorily.

5. Because of the nature of the MAB program and the role played by UNESCO, the simplest and most efficient interim alternative is to make maximum use of direct contributions to UNESCO (Funds-in-Trust, donations, etc.) backed up by a significant level of USMAB-managed international activities. There should be increasing involvement of nongovernmental organizations such as IUCN and ICSU.

ANNEX A

UNESCO APPROVED BIENNIAL PROGRAM AND BUDGET: 1984-85

Major Programs		($000)
I.	Reflection on World Problems and Future Oriented Studies	$ 2,729
II.	Education for All	31,131
III.	Communication in the Service of Man	16,157
IV.	Formulation and Application of Education Policies	35,546
V.	Education, Training and Society	17,106
VI.	THE SCIENCES AND THEIR APPLICATION TO DEVELOPMENT	30,483
VII.	Information Systems and Access to Knowledge	12,194
VIII.	Principles, Methods and Strategies of Action for Development	11,052
IX.	SCIENCE, TECHNOLOGY AND SOCIETY	7,586
X.	HUMAN ENVIRONMENT, TERRESTRIAL AND MARINE RESOURCES	31,177
XI.	Culture and the Future	25,554
XII.	Elimination of Prejudice, Intolerance, Racism and Apartheid	1,630
XIII.	Peace, International Understanding, Human Rights and the Rights of People	5,540
	SUETOTAL: Major Program	$227,885
	General Policy and Direction	25,780
	General Activities and Services	143,141
	SUBTOTAL: Direction and Services	$168,921
	TOTAL PROGRAM	$396,806
	Less Other: Balance of Currency Fluctuations, Absorption of Reductions, etc.*	- 22,396
	AGREED 1984-85 PROGRAM	$374,410
	TOTAL FROM OTHER SOURCES	$233,937
	GRAND TOTAL	$608,347

*Adjustments, including the absorption of reductions among various activities have not been distributed since they were not known at the time of preparing this table.

ANNEX B

UNESCO APPROVED PROGRAM AND BUDGET (1984-85)
SUMMARY OF UNESCO SCIENCE ACTIVITIES

The following tables provide an overview in gross terms of the 1984-85 UNESCO biennial program and budget for science activities. Adjustments including the absorption of reductions among the various program activities leading to the final approved biennial budget have not been distributed but rather taken out of overhead plus general policy and direction--this leads to a somewhat larger available program budgets and lower overhead charges than is actually the case. These tables have been prepared to provide orders of magnitude for major science program categories.

Explanation of table headings "Overhead, etc." and "Other" are given below.

- OVERHEAD, etc. - General activities; support, administration, communication services; general policy and direction, less amount (2.8 percent of original proposed budget), which will be absorbed during course of execution of program.

- OTHER - Additional resources provided in support of related activities with oversight by UNESCO; e.g., UNDP, UNEP, UN Financing System, Funds-in-Trust, etc.

UNESCO SCIENCE ACTIVITIES (1984-85)

Summary of Major Programs VI, IX, & X

($000)

		Project Costs	Staff & Indirect	Work Years	Regular Program	Regular Program + Overhead, etc. (64.3%)	Other
VI	The Sciences & Their Application to Development	16,063	14,419	336.5	30,482	50,085	36,203
IX	Science, Technology & Society	3,265	4,321	102	7,586	12,464	3,330
X	The Human Environment & Terrestrial & Marine Sciences	13,834	17,342	407	31,766	51,223	26,461
	TOTAL	33,162	36,082	845.5	69,244	113,770	65,994

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UNESCO SCIENCE ACTIVITIES (1984-85)

Major Program VI:

"The Sciences and Their Application to Development"

($000)

		Project Costs	Staff & Indirect	Work Years	Regular Program	Regular Program + Overhead, etc. (64.3%)	Other
VI.1	Natural Sciences	5,085	3,155	71	8,240	13,540	9,873
VI.2	Technology & Engineering	2,068	3,482	81	5,550	9,120	23,305
VI.3	Key Areas in S&T	3,844	3,399	80	7,243	11,900	2,500
VI.1-3	Subtotal	[10,997]	[10,036]	[232]	[21,033]	[34,560]	[35,678]
VI.4	Social & Human Sciences	4,320	3,711	88.5	8,031	13,195	525
VI.5	Key Areas in Social & Human Sciences	746	672	16	1,418	2,330	---
VI.4-5	Subtotal	[5,066]	[4,383]	[104.5]	[9,449]	[15,525]	[525]
VI	TOTAL	16,063	14,419	336.5	30,482	50,085	36,203

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UNESCO SCIENCE ACTIVITIES (1984-85)

Major Program IX:

"Science, Technology and Society"

($000)

		Project Costs	Staff & Indirect	Work Years	Regular Program	Regular Program + Overhead, etc. (64.3%)	Other
IX.1	Science, Tech. & Society	1,249	1,379	32	2,628	4,319	360
IX.2	Science, Tech. Policies	2,016	2,942	70	4,958	8,145	2,970
IX	TOTAL	3,265	4,321	102	7,586	12,464	3,330

UNESCO SCIENCE ACTIVITIES (1984-85)

Major Program X:

"The Human Environment and Terrestrial and Marine Resources"

($000)

		Project Costs	Staff & Indirect	Work Years	Regular Program	Regular Program + Overhead, etc. (64.3%)	Other
X.1	Earth's Crust, Mineral and Energy Resources	2,202	2,041	47	4,243	6,971	3,960
X.2	Natural Hazards	612	1,281	30.5	1,893	3,110	668
X.1-2	Subtotal	[2,814]	[3,332]	[77.5]	[6,136]	[10,081]	[4,628]
X.3	Water Resources	2,411	2,891	68	5,302	8,710	5,822
	Subtotal	[2,411]	[2,891]	[68]	[5,302]	[8,710]	[5,822]
X.4	Ocean & Resources	3,714	4,370	102	8,084	13,281	6,490
X.5	Coasts & Islands	802	1,849	44.5	2,651	4,355	999
X.4-5	Subtotal	[4,516]	[6,219]	[146.5]	[10,735]	[17,636]	[7,489]
X.6	Land Use & Terrestrial Resources	1,932	1,875	43.5	3,807	6,254	4,306
X.7	Urban Systems	851	995	23.5	1,846	3,033	708
X.8	Natural Heritage	504	641	15	1,145	1,881	2,228
X.9	Env. Ed. & Info.	807	1,401	33	2,208	3,627	1,280
X.6-9	Subtotal	[4,094]	[4,912]	[115]	[9,006]	[14,795]	[8,522]
	TOTAL	13,835	17,344	407	31,179	51,222	26,461

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ANNEX C

LIST OF ACRONYMS

AAAS	American Association for the Advancement of Science
ACM	Association for Computing Machinery, U.S.
AES	Associated Expert Scheme
AGID	Association of Geoscientists for International Development
AID	Agency for International Development, U.S.
ALESCO	American Library and Educational Services Company
AMU	African Mathematical Union
ANSTI	African Network of Science and Technology Institutions
APSO	Asian Physical Society
ASEAN	Association of South-East Asian Nations
ASFIS	Aquatic Sciences and Fisheries Information System
AUP	African Union of Physics
BBS	Directorate of Biological, Behavioral and Social Sciences (NSF)
BOSP	Board on Ocean Sciences and Policy (NRC)
BOSTID	Board on Science and Technology for International Development (NRC)
CBASSE	Commission on Behavioral and Social Sciences and Education (NRC)
CCCO	Committee on Climatic Changes and the Ocean (SCOR/IOC)
CODATA	Committee on Data for Science and Technology (ICSU)
CGMW	Commission for the Geological Map of the World
CIFEG	International Center for Geological Training and Exchanges
CIPL	Permanent International Committee on Linguist
CLAB	Latin American Centres for Biological Sciences
CLAF	Latin American Centres for Physics
CLAMI	Latin American Centres for Mathematics and Informatics
CMEA	Council for Mutual Economic Assistance
COSPAR	Committee on Space Research (ICSU)
COSTED	Committee on Science and Technology in Developing Countries (ICSU)
COWAR	Committee on Water Research (ICSU)
CTS	Committee on the Teaching of Science (ICSU)
DFD	Data for Development

ECA	Economic Commission for Africa
ECE	Economic Commission for Europe
ECLA	Economic Commission for Latin America
ECOR	Engineering Committee on Ocean Resources
ECOSOC	Economic and Social Council of the United Nations
EPS	European Physical Society
FAO	Food and Agricultural Organization
FIT	Funds-In-Trust
GARS	Geological Applications of Remote Sensing
GEBCO	General Bathymetric Chart of the Oceans
GERT	Giant Equatorial Radio Telescope
GIPME	Global Investigation of Pollution in the Marine Environment
GOs	Governmental Organizations
IABO	International Association for Biological Oceanography (IUBS/ICSU)
IAEA	International Atomic Energy Agency
IAGC	International Association for Geochemistry and Cosmochemistry
IAGOD	International Association on the Genesis of Ore Deposists
IAH	International Association of Hydrogeologists (IUGS/ICSU)
IAHS	International Association of Hydrological Sciences (IUGS/UCSU)
IAMAP	International Association of Meteorology and Atmospheric Physics (IUGG/ICSU)
IAPSO	International Association for the Physical Sciences of the Ocean (IUGG/ICSU)
IASPEI	International Association of Seismology and Physics of the Earth's Interior (IUGG/ICSU)
IAVCEI	International Association of Volcanology and Chemistry of the Earth's Interior (IUGG/ICSU)
IBI	Intergovernmental Bureau of Informatics
IBN	International Biosciences Networks (ICSU)
IBP	International Biological Program (ICSU)
IBRO	International Brain Research Organization
ICC	International Coordinating Council
ICES	International Council for the Exploration of the Sea
ICL	Interunion Commission on the Lithosphere (IUGG-IUGS/ICSU)
ICMS	International Center for Mathematical Sciences
ICPAM	International Center for Pure and Applied Mathematics
ICPHS	International Council for Philosophy and Humanistic Studies
ICRAF	International Council for Research on Agroforestry
ICRO	International Cell Research Organization
ICSEM	International Commission for the Scientific Exploration of the Mediterranean Sea
ICSSD	International Committee for Social Science Information and Documentation
ICSU	International Council of Scientific Unions
ICTP	International Centre for Theoretical Physics
IDEA	International Institute of Advanced Studies (Venezuela)

IFAC	International Federation of Automatic Control
IFDO	International Federation of Data Organizations in the Social Sciences
IFIAS	International Federation of Institutes of Advanced Studies
IFIP	International Federation of Information Processing
IFLA	International Federation of Library Associations
IFS	International Foundation for Science
IGCP	International Geological Correlation Program
IGOSS	Integrated Global Ocean Services System
IHO	International Hydrographic Organization
IHP	International Hydrological Program
IIAS	International Institute of Administrative Sciences Analysis
IIASA	International Institute for Applied Systems Analysis
ILO	International Labor Organization
IMEKO	International Measurement Confederation
IMO	International Maritime Organization
IMU	International Mathematical Union (ICSU)
INISSE	International Institute of Space Sciences and Electronics
INQUA	International Union for Quarternary Research
IOC	Intergovernmental Oceanographic Commission
IOCARIBE	IOC Association Carribbean Adjacent Regions
IOCD	International Organization for Chemistry for Development
IODE	International Oceanographic Data Exchange
IOLM	International Organization of Legal Metrology
IPSA	International Political Science Association
ISC	International Seismological Centre
ISSC	International Social Science Council
IUAES	International Union of Anthropological and Ethnological Sciences
IUBS	International Union of Biological Sciences (ICSU)
IUCN	International Union for Conservation of Nature and Natural Resources
IUFRO	International Union of Forestry Research Organizations
IUGG	International Union of Geodesy and Geophysics (ICSU)
IUGS	International Union of Geological Sciences (ICSU)
IUMS	International Union of Microbiological Societies (ICSU)
IUPAP	International Union of Pure and Applied Physics (ICSU)
MAB	Man and the Biosphere Program
MARPOLMON	Marine Pollution Research and Monitoring Program
MIRCENs	Microbiological Resources Centers (World Network)
NAS	National Academy of Sciences
NGOs	Nongovernmental Organizations
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NSF	National Science Foundation
OAS	Organization of American States
OAU	Organization of African Unity
OECD	Organization for Economic Cooperation and Development
OES	Bureau of Oceans and International Environmental and Scientific Affairs (Department of State)
OSTP	Office of Science and Technology Policy

PGI	General Information Program
PIPICO	Panel on International Programs and International Cooperation in Oceans Affairs (U.S. Interagency)
PSMSL	Permanent Service for Mean Sea Level
SCOPE	Scientific Committee on Problems of the Environment (ICSU)
SCOR	Scientific Committee on Oceanic Research (ICSU)
SEAMS	South-East Asian Mathematical Society
SPIN	Strategies and Policies for Informatics
SSRC	Social Science Research Council
STI	Scientific and Technical Information
STIA	Directorate on Scientific, Technological and International Affairs (NSF)
TCDC	Technical Cooperation between Developing Countries
TEMA	Training, Education and Mutual Assistance
UIA	International Union of Architects
UITA	Union of International Technical Associations
UN	United Nations
UNCSTD	United Nations Center for Science and Technology for Development
UNDP	United Nations Development Program
UNDRO	United Nations Disaster Relief Organization
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFPA	United Nations Fund for Population Activities
UNFSSTD	United Nations Financing System for Science and Technology for Development
UNICEF	United Nations Children's Emergency Fund
UNIDO	United Nations Industrial Development Organization
UNISIST	UNESCO-ICSU Joint Project to Study the Feasibility of a World Information System
UNITAR	United Nations Institute for Training and Research
UNRISD	United Nations Research Institute for Social Development
UNSO	United Nations Sudano-Sahelian Office
UNU	United Nations University
USGS	U.S. Geological Survey
USMAB	U.S. National Committee for Man and the Biosphere
WCP	World Climate Program
WCRP	World Climate Research Program
WDC	World Data Center
WFEO	World Federation of Engineering Organizations
WHO	World Health Organization
WMO	World Meteorological Organization
WOCE	World Ocean Climate Experiment
WWF	World Wildlife Fund

UNESCO SCIENCE PROGRAMS:
IMPACTS OF U.S. WITHDRAWAL AND
SUGGESTIONS FOR ALTERNATIVE INTERIM ARRANGEMENTS

A Preliminary Assessment

SUPPLEMENT

(Including an inventory and program commentary)

INTRODUCTION

This Supplement provides an inventory of the following program areas within Major Programs VI, IX, and X:

VI. The Sciences and Their Application to Development

- Natural Sciences (VI.1); Technology and Engineering (VI.2); Key Areas (VI.3)
- Social and Human Sciences (VI.4); Key Areas (VI.5)

IX. Science, Technology and Society

- Relations (IX.1); S&T Policies (IX.2)

X. The Human Environment and Terrestrial and Marine Resources

- Earth Sciences and Resources (X.1); Natural Hazards (X.2)
- Water Resources (X.3)
- Oceans and Resources (X.4); Coastal and Island Regions (X.5)
- Environmental Sciences: Man and the Biosphere (X.6-X.9)

The presentation corresponds to the program discussion in Chapter 4 of the NRC report, UNESCO Science Programs: Impacts of U.S. Withdrawal and Suggestions for Alternative Interim Arrangements, A Preliminary Assessment.

At the beginning of each program, there is an overall comment followed by options for alternative arrangements to maintain U.S. scientific interactions. The content of the individual programs are summarized with identification of interactions with other governmental and nongovernmental organizations. (See UNESCO Approved Programme and Budget for 1984-85 for additional details.) A brief summary of programs V.2, VII, and General Activities (these are not discussed in the NRC report) is presented at the end of the Supplement.

At the request of the Department of State, an attempt has been made to characterize the programs using the following codes:

(1) primarily of concern to the U.S. scientific community;
(2) primarily of concern to the scientific community of the developing world;

and within each of these categories:

(a) high value;
(b) medium value or unknown;
(c) marginal or no value.

It is important to note that these characterizations, particularly (a), (b), or (c), have often been assigned on the basis of minimal information; any proper evaluation would require a careful, time-consuming examination. In assigning value codes, UNESCO performance in implementing a program activity was also considered. Little information was available on many programs, which were therefore qualified (b).

At the beginning of each program, biennial budget figures drawn from the UNESCO Approved Programme and Budget for 1984-85 are given. These figures are annualized in a second column and from that point on, all figures are presented on a yearly basis. The UNESCO budget includes project costs, staff costs (roughly equal to the project costs) and overhead (64.3%). In the inventory, the figure given at the beginning of the description of each subprogram is the project cost only. The purpose in giving this figure is to provide an indication of the relative magnitude of each subprogram. Budgetary figures within parentheses at the end of each entry represent project support from outside sources.

With respect to alternatives, particular attention has been given to specific program support through "Funds-in-Trust" and "donations" mechanisms when appropriate. These mechanisms make it possible for outside sources to contribute to specific UNESCO-sponsored activities. However, direct oversight of the contributions is limited; some form of periodic accountability may be possible.

- Funds-in-Trust are monies received by UNESCO from Member States or organizations (international, regional or national governmental or nongovernmental) for the purpose of enabling UNESCO to carry out specific activities on their behalf and at their request. Under this system, UNESCO acts as the trustee to oversee the uses of the funds that are usually directed towards a specific need in a particular country or region.

- Donations are gifts, bequests, and subventions (or contributions) that UNESCO may receive directly from governments, public and private institutions, associations and private persons. The Director-General of UNESCO, with the approval of the Executive Board, is authorized to add to the current appropriation funds from donations and special contributions for activities within the Approved Programme and Budget for 1984-85.

MAJOR PROGRAM VI:
THE SCIENCES AND THEIR APPLICATION TO DEVELOPMENT

VI.1: Research Training and International Cooperation in the Natural Sciences

	Biennial ($000)	Annual ($000)
Regular program	$ 8,240	$4,120
of which staff costs	3,155	1,578
of which project costs	5,085	2,542
Regular program plus overhead (64.3%)	13,540	6,770
Other sources (see below)	9,873	4,937

Overall comment on VI.1: This program area provides continuity in the basic cooperative objectives of the original UNESCO science program as extended to support the needs of the developing countries. This area is of primary concern to the health of world science. U.S. oversight of program planning and management could be indirectly maintained, at least in part, through U.S. participation in NGOs as well as through monitoring the expenditure of U.S. funds by an appropriate body sensitive to U.S. interests such as NSF and/or NRC. The total annual program budget (projects, staff and overhead) for these activities is approximately $6.8 million; the U.S. share is $1.7 million. Current annual U.S. contributions in support of VI.1 regular program activities (projects, staff costs, but not overhead) are about $1 million. If further funds are available, selected activities should receive additional support. It is recom- mended that support of activities in this area be about $1.8 million per year including oversight/overhead costs.

Alternative Option 1: Most UNESCO-sponsored VI.1 projects might be supported by providing funds to the organizations managing them through ICSU. This option may provide better monitoring of scientific activities than is currently the case. If the United States provides support for program activities through ICSU to the NGOs, there will be a need to explore possibilities for the secondment of a science administrator to ICSU to implement this approach. In addition, funds could be provided to a U.S. agency (e.g., NSF or AID) to support U.S. participation in bilateral programs. There will be significant administrative costs for ICSU and the other NGOs, as well as for the U.S. agency. These costs are included in the figures that follow:

Alternative Option 1:

Support to NGOs for UNESCO-related science activities	$1,350,000
Secondment of science administrator and supporting services to ICSU	150,000
Bilaterals through U.S. institutions	300,000
TOTAL	$1,800,000

Alternative Option 2: The record to date of UNESCO management of program area VI.1 is acceptable. Under these circumstance, a second option for alternative support would be a contribution to UNESCO (Funds-in-Trust, donations, etc.) to cover the current U.S. share of regular program costs, plus 10% overhead. This would total $1,100,000. Augmented support of NGO-sponsored science activities is proposed at a level of $700,000. The total under this option is $1,800,000.

Contribution to UNESCO (Funds-in-Trust, donations, etc.)	$1,100,000
Support to NGOs activities under U.S. oversight	700,000
TOTAL	$1,800,000/yr.

VI.1.1 Strengthening of National Research Potential and Improvement of Infrastructures

VI.1.1.1 Mathematics

$98,450 2 - b

10 courses for developing countries; research grants; seminars; periodicals; directory in cooperation with IMU, International Center for Pure and Applied Mathematics (ICPAM), International Center for Mathematical Sciences (ICMS) and IIASA.

VI.1.1.2 Physics

$55,150 2 - b

Research grants to Africa and Asia in cooperation with IUPAP and regional/national associations; 6 research seminars with concentration on microelectronics and solar conversion; proceedings.

VI.1.1.3 Chemistry

$138,550 2 - a

Research grants to developing countries; technical assistance; 4 courses in advanced research techniques--natural products, electrochemistry, agricultural and environmental chemistry; International Organization for Chemistry for Development (IOCD) training and research activities through regional networks in Southeast Asia, central and south Asia, Caribbean and Latin America; cooperation with International Foundation for Science (IFS) for symposium and grants with reference to 5th Asian Symposium on Medicinal Plants and Spices.

VI.1.1.4 Biology

$148,200 2 - a

Regional and national research activities in molecular and cellular biology, microbiology, genetics, neurobiology; cooperation with ICRO, 10 research courses--grants to 10 laboratories/research workers in neurobiology; IBRO, 10 research seminars in Latin America, 2 in Asia and traveling lectures in Europe.

VI.1.1.5 Network of Postgraduate Training and Research Courses
$163,950 2 - a/b
40 courses of 6 months duration in developing countries in a variety of basic fields.

Comment on VI.1.1: These program activities in basic and applied natural sciences have proven of considerable value for strengthening infrastructures and solving specific research problems in developing countries. American scientists have been active in all of these activities and have played leading roles particularly in the biology and chemistry projects. Assuming that funds might be available from other parts of the overall U.S. contribution to UNESCO programs, priority attention should be given to possibilities for augmenting the following UNESCO-sponsored activities through support to the relevant organizations:

International Organization for Chemistry for Development (IOCD)	$200,000
International Cell Research Organization (ICRO)	100,000
International Brain Research Organization (IBRO)	100,000
International Center for Theoretical Physics (ICTP)	100,000
Johns Hopkins School of Hygiene and Public Health	100,000
ICSU, International Biosciences Networks (IBNs)	100,000
SUBTOTAL	$700,000/yr.

VI.1.2 University and Postgraduate Training with Special Efforts Aimed at Inceasing the Participation of Women
$136,450 2 - a/b
Curricula for physics and chemistry, particularly in Arab states and Africa, familiarizing 80 university teachers with laboratory equipment, training of 50 laboratory technicians (Asia); pilot projects, special training courses in Africa, Asia and Pacific, biological sciences in Arab states, mathematics curricula in Africa; 3 demonstration workshops, services of consultants in cooperation with Centre for S&T Education in India, and Ljubljana International Center for Chemistry Studies; grants to attend international symposium on chemistry education in Japan, union science education activities.

Comment on VI.1.2: Specific U.S. support for university curricula development should be included under VI.1.1, above. This area of work is linked to UNESCO major program area V.2 on S&T education, a key area of activity.

VI.1.3 Development of Regional and International Cooperation

VI.1.3.1 Cooperation with ICSU
$689,500 1 - a
Subvention and special support activities--International Biosciences Networks (IBNs); 2 fellowships; S&T information exchange.

VI.1.3.2 Cooperation with Other NGOs
$89,150 2 - b
International Foundation for Science (chemistry and biology research workers); travel grants in cooperation with Committee on S&T in Developing Countries (COSTED)--meetings and symposia of IBRO, ICRO and IOCD; technical assistance to developing countries.

VI.1.3.3 Advanced Postgraduate Research and Training
$517,600 2 - a
Support to International Center for Theoretical Physics (ICTP) for postgraduate studies.

VI.1.3.4 Regional Cooperation in Basic Sciences
$303,750 2 - a/b
Cooperation between European and North American institutions--cellular and molecular biophysics, molecular biology and biomaterials electrochemistry; chemistry of natural organic substances, natural substances, applied mathematics; cooperation extended to developing country institutions, pilot project with School of Hygiene and Public Health (Johns Hopkins); Africa, mathematics, chemistry, biosciences; Arab states, informatics, all sciences; Latin America and Caribbean, IUPAP-sponsored seminars; Asia and Pacific, all disciplines.

VI.1.3.5 Regional Centers
$68,950 2 - b
Latin American Centres for Biological Sciences (CLAB), Mathematics and Informatics (CLAMI), Physics (CLAF); International Institute of Space Sciences and Electronics (INISSE), studies of Giant Equatorial Radio Telescope (GERT).

VI.1.3.6 Regional Scientific Unions
$42,550 2 - b
African Mathematical Union (AMU), South-East Asian Mathematical Society (SEAMS), Latin American Federation of Mathematics; African Union of Physics (AUP); Asia (Asian Physical Society, APSO); Europe (European Physical Society, EPS).

Comment on VI.1.3: Most subprograms in this program area require sustained U.S. participation, leadership, and increased support. Particular emphasis is given here to the advancement of scientific

knowledge through subventions to the International Council of Scientific Unions which, in turn, supports the activities of individual unions including an increasing number of special advanced training activities. Support is also provided to cooperative activities involving significant numbers of American scientists sponsored by other NGOs, centers of advanced studies, and regional training in the sciences.

U.S. contributions to UNESCO project and staff costs, exclusive of overhead (approximately $800,000), could be channeled to NGOs and U.S. professional societies and universities (the budget figures which follow include overhead and managerial costs):

3.1 ICSU Subvention: $300,000
Increase U.S. share of subvention (currently $135,000 via UNESCO) to include secondment of a science administrator to ICSU.

3.2 Other NGOs: $ 100,000
International Foundation for Science (IFS), COSTED, IBRO, ICRO, IOCD (see VI.1.1, above) for meetings and advisory services.

3.3 Physics: $100,000
ICTP (see VI.1.1, above).

3.4 Regional Cooperation: $200,000
Johns Hopkins University; IOCD, IUPAP (see VI.1.1, above); bilaterals via NSF/AID/NRC.

3.5 Regional Centers: $50,000
Bilaterals via NSF/AID/NRC.

3.6 Regional Scientific Unions: $50,000
Bilaterals via NSF/AID/NRC.

Another option is to provide the current level of U.S. contributions to VI.1.3 program and Funds-in-Trust overhead charges totaling approximately $800,000/year to UNESCO (Funds-in-Trust, donations, etc.).

TECHNICAL COOPERATION PROGRAMS

1. Consulting services, study grants, etc.: $90,100 2 - b
Comment: No specific additional support is recommended. Requirements should be considered under arrangements proposed in VI.1.3, above.

2. UNDP: ($4,497,500)
(Some 18 projects: faculty training and programs and development of research centers in Chad, Uganda, China, Laos, Pakistan, Albania, Bulgaria; Brazil, India, Indonesia, Vietnam; African Biosciences Network plus new projects)

3. UN Financing System: ($125,000)
   (Faculty training in Paraguay, Swaziland, plus new projects)

4. Funds-in-Trust: ($250,000)
   (Sri Lanka, Libya institutes and national academies, self financed)

5. Voluntary Contributions: ($10,000)
   (Theresa McKay Fund in cooperation with ICSU)

6. Associated Expert Scheme (AES): ($54,000)

VI.2: Research, Training and International Cooperation in Technology and the Engineering Sciences

	Biennial ($000)	Annual ($000)
Regular program	$ 5,550	$ 2,775
of which staff costs	3,482	1,741
of which project costs	2,068	1,034
Regular program and overhead (64.3%)	9,120	4,560
Other sources (see below)	23,305	11,653

Overall comment on VI.2: This program area includes potentially valuable training and cooperative research activities in the engineering sciences and in technology directed towards the needs of developing countries. Of the slightly more than one million dollars provided for projects, about $250,000/year go to infrastructure building possibly appropriate for oversight by other UN agencies; $400,000/year to engineering educational purposes; and $350,000/year to promotion of cooperative interactions primarily at a regional level, also possibly appropriate for other UN agency oversight. Although there appears to be limited interaction with the U.S. engineering/industrial community in implementing program VI.2 activities, there would be even less direct U.S. oversight of program planning and management after U.S. withdrawal from UNESCO. Current annual U.S. contributions in support of VI.2 regular program activities plus overhead ($4.5 million) are about $1.1 million; the U.S. share of program costs ($2.8 million) would be $700,000/year. Significant sup- port from other sources, particularly UNDP and Funds-in-Trust, total more than $11.6 million per year. It is proposed that support for multilateral activities on the order of $700,000/year, including oversight/overhead costs be provided beginning with FY 86. It is important to support an appropriate body sensitive to U.S. interests, such as NSF and/or NRC, to monitor these activities. This is an important area which will benefit from much greater involvement by U.S. professional engineering societies.

Alternative Option 1: This overall program could involve U.S. engineering professional organizations working with international

and regional engineering organizations and exploiting the strength of U.S. engineering and technological institutions of higher learning. Activities could reinforce UNESCO-sponsored projects. Support would be provided through grants to U.S. professional societies and institutions of higher learning for complementary activities with nongovernmental organizations such as the World Federation of Engineering Organizations (WFEO):

Infrastructure Building Activities (VI.2.1)	$150,000
Training of Engineers (VI.2.2)	350,000
Regional Engineering Cooperation	200,000
TOTAL	$700,000

Alternative Option 2: Support could be provided through UN auspices such as UNDP, UNIDO, and the UN Financing System for Science and Technology for Development, for activities directed toward infrastructure building and regional cooperation. Engineering education activities could be managed by U.S. professional societies or U.S. universities:

Infrastructure development and regional cooperation activities--UN agencies	$350,000
Engineering education activities to complement UNESCO projects through U.S. engineering professional societies and universities	350,000
TOTAL	$700,000

VI.2.1 Strengthening of National Potential for Research and Technological Adaptation, and Improvement of Infrastructures and Technological Facilities

VI.2.1.1 Infrastructures and Technical Facilities

$105,600 2 - b/c

Support to specialized technological institutions in developing countries; travel grants to metrology courses organized by International Measurement Confederation (IMEKO); 5 workshops in regions, consulting services in collaboration with Union of International Technical Associations (UITA) and International Organization of Legal Metrology (IOLM), World Federation of Engineering Organizations (WFEO) for development of information services in engineering schools and training materials in metrology and materials sciences.

VI.2.1.2 Technological Research, Adaptation, and Innovation

$146,550 2 - b/c

Consulting services for the development of research activities and training materials; cooperation with Habitat,

International Union of Architects (UIA) training courses and services in various regions; pilot project with African Network of S&T Institutions (ANSTI) for seminars, studies; technical cooperation with various regions.

Comment on VI.2.1: This technologically-oriented program aimed at strengthening infrastructures could provide useful support to important development assistance activities involving NGOs such as the International Measurement Confederation (IMEKO), the Union of International Technical Associates (UITA), the International Organization of Legal Metrology (IOLM), and the World Federation of Engineering Organizations (WFEO). This area, of important concern for developing country interests, could be guided by other UN organizations. U.S. contributions in support of these activities, currently at a level of $150,000/year for project and staff costs but not overhead, should be monitored by U.S. professional engineering societies.

Alternative Option 1 is support through U.S. professional societies for bilateral/multilateral engineering development activities; Alternative Option 2 is support through other UN agencies such as UNDP, UNIDO, and the UN Financing System monitored by U.S. professional engineering bodies.

VI.2.2 Training of Engineers and Technicians, with Special Efforts Aimed at Increasing the Participation of Women

VI.2.2.1 New Methods for Teaching Engineering
$201,650 2 - b
Training through sequences of study; seminars in 8 countries, seminars, case studies on new technologies, social impacts, symposium on innovations in training of technicians in cooperation with WFEO; 2 publications, 5 handbooks, directory of engineering education institutions in developing regions; study tours.

VI.2.2.2 Cooperation between Universities and Industry
$68,900 2 - b
Six national projects linked to regional offices; network for information exchange.

VI.2.2.3 Postgraduate Training and Continuing Education
$123,350 2 - b
Meeting of international working group on continuing education; 15 courses, primarily Western institutions (other than the United States and Canada).

Comment on VI.2.2: Similar in concept to VI.2.1, these particular program activities are focused on strengthening training of engineers and technicians in developing countries, an appropriate area for UNESCO (and within its capability). There may be modest involvement of U.S.

engineering educators in these activities. However, no U.S. universities are involved in postgraduate training activities. Reinforcement of these training activities should be provided through U.S. professional engineering societies in close collaboration with UNESCO project activities. U.S. contributions to project and staff costs, but not overhead, are currently about $350,000/year.

Alternative Option 1 would provide this level of support to U.S. professional societies and universities for bilateral/multilateral engineering training and curricula development activities; Alternative Option 2 is provision of $350,000 to UN agencies (UNDP or UN Financing System) for reinforcing UNESCO engineering education activities.

VI.2.3 Development of Regional and International Cooperation

VI.2.3.1 Promotion of Cooperation
$119,850 2 - b
Cooperation among institutions in developing countries, information exchange, cooperation with regional professional institutions (International Center for Heat and Mass Transfer, International Institute of Advanced Studies in Caracas; travel grants, participation in activities of WFEO, and a multitude of regional engineering associations.

VI.2.3.2 Networks of Training Institutions
$54,250 2 - b/c
In all regions, undefined.

VI.2.3.3 Southeast Asia and Pacific Project
$135,150 2 - b
5 working groups (workshops/seminars, cooperative joint projects, exchange of teachers, cooperation with Federation of Engineering Institutions in SE Asia and Pacific.

Comment on VI.2.3: This area of concern would profit from integration into a single line item. For the same reasons noted under subprogram VI.2.1, above, it would seem appropriate for U.S. support of these activities, currently at a level of $200,000/yr. for project and staff costs but not overhead, be provided to U.S. professional engineering societies and institutions of higher education for bilateral/multilateral activities. A second option for supporting regional cooperative activities is provision of $200,000 to other UN agencies, such as UNDP and the UN Financing System, with monitoring by a U.S. body sensitive to U.S. interests.

TECHNICAL COOPERATION PROGRAMS

1. Consulting services: $78,550 2 - b
Comment: No specific additional support is recommended. Requirements for consultant and training needs should be considered under arrangements proposed in VI.2.3 above.

2. UNDP: ($4,452,500)
   24 projects: Faculty training and development of technical centers in Burundi, Mali, Malawi, Nigeria, Uganda, Jamaica, Trinidad & Tobago, Bangladesh, India, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Lebanon, Morocco, Turkey; regional African Network of S&T institutions, plus new projects.

3. Regional Banks: ($1,000,000)

4. Funds-in-Trust: ($5,965,000)
   (Iraq, Libya--self financed, Bangladesh financed by Norway.)

5. Associate Expert Scheme (AES): ($235,000)

VI.3: Research, Training and International Cooperation in Key Areas in Science and Technology

	Biennial ($000)	Annual ($000)
Regular Program (84-85)	$ 7,243	$3,622
of which staff costs	3,399	1,670
of which project costs	3,844	1,922
Regular Program and Overhead (64.3%)	11,900	5,950
Other sources	2,500	1,250

Overall comment on VI.3: This program area includes a range of applied research and training activities having mixed usefulness within the designated fields of informatics, applied microbiology, and renewable energy resources. All are directed towards the needs of developing countries. Some might benefit from oversight by other UN agencies. As far as UNESCO program planning and implementation are concerned, the United States would have a limited role in guiding such efforts after a U.S. withdrawal from UNESCO except through indirect contacts via NGOs. The total annual program budget (projects, staff and overhead) for these activities is about $6 million of which the U.S. share would be $1.5 million. The U.S. contribution to program costs ($3.6 million) is approximately $900,000/year. It is proposed that selected activities, noted below, be supported at a level of $1 million/year. There is a mix of alternatives to consider depending on the particular area and preferred mechanism:

Alternative Option 1:

Informatics (selected activities): Nationally managed activities with possible use of other UN agencies — $ 500,000

Microbiology MIRCENs ($125,000) via Funds-in-Trust U.S. institutions ($125,000)	250,000
Renewable energy UN agencies; UNDP, UN Financing System	250,000
SUBTOTAL	$1,000,000

Alternative Option 2:

Informatics (selected activities): UNESCO (Funds-in-Trust, donations, etc.)	$ 500,000
Microbiology MIRCENs via ICSU or ICRO - $125,000 U.S. institutions - $125,000	250,000
Renewable energy U.S. institutions	250,000
SUBTOTAL	$1,000,000

In all cases, there would be a need to have an appropriate body sensitive to U.S. interests (NSF/AID/NRC) to oversee, monitor and guide these project investments. Staff/overhead costs for such management needs are included in the above budget proposal.

VI.3.1 Informatics

VI.3.1.1 Strategies for Development of Informatics
$55,300 2 - b
Assessments, regional seminars, consultative services.

VI.3.1.2 Applied Informatics and Informatics Training Centers
$578,350 2 - a
General training in microinformatics, development of teaching materials, pilot experiments--training of specialists in cooperation with International Federation for Information Processing (IFIP), seminars, postgraduate courses, Japan, Italy, Greece, mobile courses; Council for Computing Development (UK); 4 training and retraining courses in various regions, development of data banks and services.

VI.3.1.3 Social Consequences of Informatics Applications
$55,300 1 - c
Case studies linked to IX and VI.4; regional cooperation with European Coordination Center for Research and Documentation in Social Sciences; informatics and human rights linked to XIII.

VI.3.1.4 Acquisition and Adaptation of Technologies

$80,150 2 - b

Pilot experiments on applications of microinformatics, linked to IV.1.

VI.3.1.5 Development of Informatics

$274,150 2 - b/c

Statutes for intergovernmental program on informatics; regional cooperation in developing countries; cooperation with Intergovernmental Bureau for Informatics (IBI) linked to International Federation of Automatic Control (IFAC) and Data for Development (DFD); preparation of 2nd Conference on Strategies and Policies for Informatics (SPIN II) in cooperation with IBI.

Comment on VI.3.1: Some of the activities, particularly pertaining to training in applied informatics, are of value. Fruitful interactions with the U.S. informatics community are anticipated because of the U.S. position in this field. Future support of these activities should be limited to training (VI.3.1.2), strategies (VI.3.1.1), acquisition (VI.3.4) and that part of VI.3.5 pertaining to regional training activities. Program costs (projects, staff but not overhead) for recommended items total about $1.7 million/year, of which the U.S. contribution would be $425,000/year.

Alternative Option 1: The U.S. share of program costs plus overhead ($500,000), as limited above under Comment, could be provided through nationally mananged activities with possible use of other UN agencies such as UNIDO, UNDP and the UN Financing System in cooperation with the International Federation of Information Processing (IFIP). An important complementary support mechanism to these multilateral agencies would be the involvement and oversight by U.S. professional organizations to guide international projects, particularly the U.S. Association for Computing Machinery (ACM).

Alternative Option 2: Provide U.S. contribution in support of program costs to UNESCO (Funds-in-Trust, donations, etc.) limited to items noted above. Taking into account provision of overhead on Funds-in-Trust, this would total approximately $500,000. There would be minimal oversight of the use of these funds.

VI.3.2 Applied Microbiology and Biotechnology

VI.3.2.1 Microbiological Resources Centers (MIRCENs)

$60,900 2 - a

Research grants to developing country centers on nitrogen-fixation, fermentation technology, biomethanogenesis; newsletter documentation, MIRCEN journal, regional projects in Africa and Arab states; cooperation with UNEP on microbial strains.

UNEP: ($75,000)

VI.3.2.2 Policies for Biotechnology Research

$52,150 2 - b

Cooperation with FAO, UNIDO, UNEP, International Union of Microbiological Societies (IUMS); International Organization of Biotechnology and Bioengineering and ICRO (Panel on Microbiology) to provide consultant services on drawing up policies; contribution to regional societies concerned with applications.

VI.3.2.3 Applied Microbiology and Biotechnology

$75,300 2 - a

Twelve 3-week MIRCEN courses, 10 training courses (12 month duration) in various countries in advanced applications; research grants and postgraduate studies with institutes such as the International Institute of Advanced Studies (IDEA) in Caracas; organization of international conferences on Global Impacts of Applied Microbiology (Africa, Arab states, etc.).
UNEP support: ($50,000)

VI.3.2.4 Conservation of Microorganisms

$34,700 1 - a

Establishment of national collections in cooperation with FAO, WHO, UNIDO, UNEP, International Union of Microbiological Societies, International Organization of Biotechnology and Bioengineering and ICRO (Panel on Microbiology), World Data Center on Microorganisms (Brisbane), Nordic Register, fellowships; support of MIRCEN, Stockholm.
UNEP Support: ($25,000)

Comment on VI.3.2: This is an important area of work involving a number of international scientific organizations and unions in which U.S. scientists are leaders. Program costs (projects, staff support but not overhead) for these activities total about $500,000/year of which the U.S. share would be $125,000/year. It is recommended that additional support on the order of $125,000/yr. be provided to various MIRCENs activities, assuming that such funds might be available from other areas of the overall U.S. contribution to UNESCO.

Alternative Option 1:

Provide the U.S. contribution to program costs to UNESCO (Funds-in-Trust, donations, etc.) including overhead:	$125,000/yr.
Provide additional support to MIRCENs activities via U.S. institutions:	125,000/yr.
SUBTOTAL	$250,000

Alternative Option 2:

Provide the U.S. share of program costs ($125,000) for MIRCENs activities via ICSU or ICRO, plus a further contribution of $125,000 to MIRCENs activities through U.S. institutions:

MIRCENs direct support via ICSU/ICRO	$125,000/yr.
Grants for training and consultative services to U.S. institutions in support of MIRCENs activities	125,000/yr.
SUBTOTAL	$250,000/yr.

These options require oversight by an appropriate body sensitive to U.S. interests such as NSF and/or NRC.

VI.3.3 Renewable Energies

VI.3.3.1 New and Renewable Sources Utilization
$72,000 2 - b/c
10 research projects plus 10 demonstration projects via regional offices.

VI.3.3.2 Specialists Training
$102,500 2 - b/c
Audiovisual materials, preparation of manuals; seminars; 8 postgraduate training courses of 6 months duration.

VI.3.3.3 Regional Cooperation in Development of Energy Sources
$106,950 2 - b/c
Seminars; publications, promotion of South-South cooperation; adaptation of technologies (undefined).

VI.3.3.4 Networks for Information Exchange on Energy Resources
$269,950 2 - b/c
Studies, data bases, 2nd edition of directory, consultant services; pilot projects in regional centers; International Liaison Committee coordination.

Comment on VI.3.3: This area of potentially useful work directed towards the needs of developing countries has had little interaction with U.S. government agencies--the contact with the private U.S. scientific and engineering community is not known. The annual UNESCO budget for program costs (projects and staff) plus overhead is approximately $1.7 million. Annual program costs are on the order of $1.2 million, making the U.S. share $300,000/year. In view of the other UN agencies, GOs, and NGOs that are active in dealing with renewable energy issues, there is some question as to why UNESCO should be in this area at all. It is suggested that the U.S. share of support be provided through other channels at a level of $250,000.

Alternative Option 1:

Support selected renewable energy projects through other UN agencies, such as UNDP and the UN Financing System. $250,000/yr.

Alternative Option 2:

Support projects specifically directed towards the needs of developing countries through grants to U.S. institutions under the oversight of AID and/or the National Research Council. $250,000/yr.

TECHNICAL COOPERATION PROGRAMS

1. Consultative, advisory services: $77,450/yr. 2 - b

2. UNEP (cooperation with MIRCEN network for conservation of microbial genetic resources: ($200,000/yr.)

3. UNEP (Barbados - energy saving devices; Brazil - training; new projects): ($650,000/yr.)

4. UN Financing System for S&T and Development (Lesotho - solar energy; new projects): ($50,000/yr.)

5. Funds-in-Trust (Asia - regional cooperation in chemistry and microbiology from Japan): ($350,000/yr.)

MAJOR PROGRAM VI:
THE SCIENCES AND THEIR APPLICATION TO DEVELOPMENT

VI.4: Research, Training and International Cooperation in the Social and Human Sciences

	Biennial ($000)	Annual ($000)
Regular program	$ 8,031	$4,016
of which staff costs	3,711	1,856
of which project costs	4,320	2,160
Regular program and overhead (64.3%)	13,195	6,598
Other sources	525	263

Overall comment on VI.4: The purpose of this program is to develop the social sciences, the human sciences, and philosophy by strengthening national research potential, developing education and higher education programs, and improving access to specialized information and documentation. There are potentially useful activities to develop educational materials, reinforce advanced training in the social sciences, and promote international cooperative research on important topics of interest to U.S. social scientists. The current U.S. contribution to the regular UNESCO program (projects and staff), plus overhead, is approximately $1.6 million/year. The U.S. contribution to program costs is about $1 million/year. Particular concern needs to be devoted to ensuring that subventions are maintained to the NGOs in this area --U.S. contributions through UNESCO are on the order of $150,000/year. It is proposed that an overall program budget of $1 million/year be managed by an appropriate U.S. organization sensitive to U.S. interests with the objective of supporting multilateral collaborative research and training activities in the area of social and human sciences related to current UNESCO-sponsored projects. Consideration should also be given within this proposed budget to possible suitable activities falling under program VI.5. There is no particular funding proposed in the commentary covering VI.5 activities.

VI.4.1 Strengthening of National Potential for University and Postgraduate Training and Research

$165,850 2 - b

Inventory of national potential in research, training at the higher education level, information and documentation in the social and human sciences and philosophy. Promotion of basic and problem-oriented research. Advisory services provided to Member States and NGOs at their request. Development of training and teaching at the national level in the social and human sciences.

VI.4.2 Regional and Subregional Cooperation

$369,000 2 - b

Strengthening of organizations and programs for regional, subregional and national cooperation. Launching of a series of regional publications. Contribution to intergovernmental regional conferences.

VI.4.3 Development of Interregional and International Cooperation

$1,103,900 1 - b

Expand cooperation with the main NGOs in the social and human sciences. Disseminate information in the fields of social and human sciences. Subventions to International Social Science Council (ISSC) and International Committee for Social Science Information and Documentation (ICSSD). Cooperation with following NGOs: International Council for Philosophy and Humanistic Studies (CIPSH), ISSC, ICSU, Inter-African Council for Philosophy, and the Association of African Universities.

TECHNICAL COOPERATION PROGRAMS

1. Consulting services, study fellowships, equipment or financial contributions: $521,100 2 - b

2. UNDP, postgraduate training in applied social sciences in Caribbean; new projects: ($100,000)

3. Associate Expert Scheme (AES), provision of experts to operational projects by Member States: ($162,500)

VI.5: Research Training and Regional and International Cooperation in Some Key Areas in the Social and Human Sciences

	Biennial ($000)	Annual ($000)
Regular program	$1,418	$ 709
of which staff costs	672	336
of which project costs	746	373
Regular program and overhead (64.3%)	2,330	1,165
Other sources	---	---

Overall Comment on VI.5: The purpose of this program is to promote the development of a number of disciplines in the social and human sciences, including history, geography, linguistics, anthropology and the administrative and management sciences, by increasing research and improving education and advanced training. A further purpose is to launch regional, subregional, and international cooperation in certain priority fields associated with Major Programs VIII and XIII and research and education on the status of women. The program is also to "encourage philosophical reflection and interdisciplinary research on mankind seen

in its unity." Special attention is to be devoted to the study of work and leisure activities, interdisciplinary cooperation for the study of man, and studies on the status of women. The annual U.S. contribution to program costs plus overhead would be on the order of $300,000; considering program costs, the contribution would be about $175,000/year. Because of the questionable quality of the described activites in this section, no special contribution for any of these subprojects is recommended. Consideration of possible cooperative support of certain projects based on peer review could be included within funds proposed in support of VI.4 activities.

VI.5.1 Development of a Number of Disciplines in the Social and Human Sciences

$88,050 1 - b/c

Promote training and research in the science of history, anthropology, geography, linguistics and administrative and management sciences. Linkages with International Union of Anthropological and Ethnological Sciences (IUAES), International Geographical Union (IGU), Permanent International Committee on Linguistics (CIPL), and the International Institute of Administrative Sciences (IIAS).

VI.5.2 Research and Cooperation in Key Areas AND
VI.5.3 Management, Work and Leisure Activities

$20,050 1 - c

Promote research in the social and human sciences in key areas which lend themselves to a multidisciplinary approach--to be undertaken in close relation to Major Programs VIII, XII, and XIII. Among the topics to be included: relations between peace, disarmament and development, human rights, rural development and the history of nutritional traditions, unemployment among young people, the status of women, and relations among management, work, and leisure activities.

VI.5.4 Interdisciplinary Cooperation for the Study of Man

$82,400 1 - c

Stimulate serious and widespread consideration of the unity of mankind both as a subject for scientific investigation and as a value in itself.

VI.5.5 Studies on the Status of Women and Development of New Approaches

$100,600 1 - b/c

Contribute to the development of theoretical frameworks and methodological approaches for the study of the role of women in history, and improve research on the status of women. Cooperation with the UN Regional Economic Commissions.

TECHNICAL COOPERATION PROGRAM

Consulting services, study fellowships, equipment or financial contributions: $82,000 2 - b

MAJOR PROGRAM IX: SCIENCE, TECHNOLOGY AND SOCIETY

IX.1: Study and Improvement of the Relationship Between Science, Technology and Society

	Biennial ($000)	Annual ($000)
Regular program	$ 2,628	$1,314
of which staff costs	1,379	689
of which project costs	1,249	625
Regular program and overhead (64.3%)	4,319	2,160
Other sources	360	180

Overall comment on IX.1: The purpose of this program is to achieve a better understanding of the process of acquiring, disseminating and applying new knowledge, with a view to promoting its assimilation and employment in the service of development in a variety of social and cultural situations. Case studies are to be prepared on the relationship between scientific and technological progress and the evolution of society in various social, economic and cultural contexts. This is an area of work containing a large variety of projects; many of limited or questionable value. Others worthy of encouragement involve NGOs such as ICSU and ISSC in carrying out case studies on the impacts of S&T on society and the examination of trends in research and S&T progress. The contributions to the commemoration of the centenary of Niels Bohr and the publication of the journal "Impact of Science on Society" should be supported. Much of the remaining work could profit from a careful review and evaluation. The current U.S. contribution to this UNESCO program (projects and staff), plus overhead, is about $540,000/year; the contribution to program costs would be about $330,000/year. It is proposed that an overall program budget of $250,000/year be managed by an appropriate U.S. organization (NSF/AID/NRC) sensitive to U.S. interests in order to support or complement selected UNESCO-related activities through NGOs and bilateral programs.

IX.1.1 Study of the Phenomenon of Science and Technology, its General Evolution and its Relations with Society

$183,050 2 - b/c

Produce comprehensive studies of the relationship between science, technology and society and the social assessment of technological innovations. Contribute to the creation or reinforcement in developing countries of interdisciplinary programs on the relationship between science, technology and society. Provide training for 40 specialists from LDCs.

IX.1.2 Participation of Scientists, Engineers, Technicians and the Public in Setting Priorities for and Evaluating the Effects of Scientific and Technological Progress

$65,100 1 - b/c

Encourage a greater participation by scientists from all disciplines and engineers in studies of the relationship between

scientific and technological research and the arms build-up and in strengthening their efforts to support disarmament.

IX.1.3 Science and Technology Extension Work and Making the Public Aware of What Science and Technology Have to Offer

$332,000 2 - b

Contribute to the establishment and consolidation of national programs in S&T extension work and active cooperation between Member states. Train some 20 science journalists. Publication of the journal, "Impact of Science on Society." Award science prizes.

TECHNICAL COOPERATION PROGRAMS

1. Study grants, contributions to training activities and purchase of laboratory equipment: $44,700 2 - b

2. UNDP support: ($130,000)

3. UN Financing System for S&T for Development: ($50,000)

IX.2: Science and Technology Policies

	Biennial ($000)	Annual ($000)
Regular program	$4,958	$2,479
of which staff costs	2,942	1,471
of which project costs	2,016	1,008
Regular program and overhead (64.3%)	8,145	4,072
Other sources	2,970	1,485

Overall comment on IX.2: The purpose of this program is to promote the framing of national science and technology policies which will translate socioeconomic objectives into plans of action and program budgets for research and development and science and technology services. This is an area containing a large variety of activities; many of limited or questionable value. However, the encouragement and support of regional science ministerial meetings can provide many beneficial results to the developing world enhancing the efficiency of training projects and continuing interactions with the global science community (such meetings at the European/North American level are of marginal value). Other science policy work appears to be academic or theoretical although advisory services to developing countries could be valuable if they include special training opportunities coupled to pragmatic development problems and measures to increase the effectiveness of research institutions. Much of the remaining work could profit from a careful review and evaluation. Other UN components may be more appropriate instruments

for carrying out much of this work. The current U.S. contribution to the regular UNESCO program (projects and staff costs), plus overhead, is about $1,040,000/year; the contribution to only program costs would be $620,000/year. It is proposed that support of selected activities be provided at a level of $500,000 under the supervision of an appropriate U.S. organization (NSF/AID/NRC). Such support could be directed to NGOs, bilateral programs, and U.S. professional societies and institutions of higher learning. This program support should be coupled to proposed interim arrangements, noted in IX.1, above.

IX.2.1 Analysis of National Experience and Exchange of Information Relating to Science and Technology Policies

$464,650 2 - b

Conduct a regional survey of national S&T policies in the Latin American and Caribbean region and in the Arab states, and an analysis of the policies of Member States in Africa. Encourage interchange of experience relating to bibliographic and factual data bases for the formulation of S&T policies. Update of SPINES Thesaurus, further development of modules to process numerical data on S&T potential.

Funds-in-Trust (CASTARAB): ($162,500)

IX.2.2 Formulation of Science and Technology Policies at the National, Regional and World Level

$137,500 2 - b/c

Contribute through technical assistance to the framing, implementation and evaluation of the S&T policies of a number of Member States in the developing world. Promote preparation of operational S&T development projects in two countries, one in Asia and the other in Latin America. Facilitate coordinated implementation of joint R&D projects within economic communities established by groups of states. Participate in the development of a comprehensive S&T policy for all UN organizations.

Special Fund for Research and Experimental Development in Africa: ($50,000)

IX.2.3 Refinement of the Methods, Know-How and Techniques Needed to Manage National Scientific and Technological Development

$125,950 2 - b

Contribute to the determination of R&D priorities in a number of Latin American Member States. Facilitate the development of technological development indicators based on the unit technologies employed in the electronics, chemical and civil engineering industries. Evaluate efficiency levels of research units and institutions in Brazil, India, Spain, Nigeria, and the Ukranian SSR. Linkages with FAO, ILO, and the International Federation of Data Organizations in the Social Sciences (IFDO).

IX.2.4 Training the Skilled Personnel Needed for the Planning and Management of National Scientific and Technological Development

$136,600 2 - b/c

Establish an international scheme to develop and improve the training of planners and managers for S&T development. Create a regional network in Asia and in the Pacific region for teaching and research units in S&T policy. Develop and distribute manuals, select bibliographies and audiovisual teaching aids.

TECHNICAL COOPERATION PROGRAMS

1. Consulting services, organizing national seminars, setting up university teaching and research units, arranging study tours: $143,050 2 - b

2. UNDP: ($870,000)
Brazil - S&T policies; Czechoslovakia - fellowships; new projects

3. UN Financing System for S&T for Development: ($250,000)
Guinea - Documentation Institute; Thailand - Ministry of S&T; new projects

4. Funds-in-Trust: ($247,500)
CASTARAB Continuing Committee; special training with reference to IX.2 activities

5. Associate Expert Scheme: ($67,500)

6. Special Fund for R&D in Africa: ($50,000)

MAJOR PROGRAM X:
THE HUMAN ENVIRONMENT AND TERRESTRIAL AND MARINE RESOURCES

X.1: The Earth's Crust and its Mineral and Energy Resources

	Biennial ($000)	Annual ($000)
Regular Program (84-85)	$4,243	$2,121
of which staff and indirect costs	2,041	1,020
of which project costs	2,202	1,101
Regular Program and overhead (64.3%)	6,979	3,489
Other sources	3,960	1,980

Overall comment on X.1: In general, the earth science program of UNESCO is well-focused and conducted in a sound manner. The International Geological Correlation Program is one of the most productive and respected of the science activities sponsored by UNESCO. This is due in large part to the fact that the scientific integrity of the program is assured through joint sponsorship by UNESCO and the nongovernmental International Union of Geological Science (IUGS), an ICSU union. The major concern is to ensure no loss of support for the IGCP, the interdisciplinary research on the earth's crust and the data/mapping activities. In all cases, project support could be significantly enhanced. Additional IGCP project support will permit increased involvement by Third World countries and needed attention to more interdisciplinary activities. A 25% loss to the total regular program budget, including UNESCO staff costs, is on the order of $600,000; with the overhead charge added, that figure is on the order of $900,000. Given the value of the program and its presently under-funded situation, a total U.S. contribution of $1.5 million is suggested.

Alternative Option 1: Provide the program costs (project, plus staff) for the IGCP ($200,000) and the other program elements ($400,000) to UNESCO through the Funds-in-Trust or donations arrangement, as well as direct support to cooperating nongovernmental and/or intergovernmental organizations (e.g., ICSU/IUGS, UNEP, IAEA) coupled with support to appropriate U.S. backstopping agencies (e.g., USGS, NSF, and/or the National Research Council) to recommend on specific implementation/allocation and to provide continuing oversight ($900,000) for a total U.S. contribution of $1.5 million.

Alternative Option 2: Provide funds directly to IUGS for support of the IGCP and invite the Union also to act as agent for channeling U.S. support to other elements of the earth sciences program. Earmark increased support for particularly needy programs such as the IGCP, interdisciplinary research of the earth's crust, i.e., the IUGS-IUGG Lithosphere Commission (ICL), special programs such as the Geological Applications of Remote Sensing (GARS) and mineral deposit modeling and other new initiatives. Negotiations would be required with IUGS to determine the overhead charges for this management task. A U.S.

national focal point would be necessary to provide oversight and guidance. A total U.S. contribution of $1.5 million is suggested.

Alternative Option 3: Provide the totality of funds (about $1.5 million) to a U.S. government agent, such as the U.S. Geological Survey, possibly with advice from the U.S. National Committee on Geology (the parent body of the U.S. national committee for the IGCP), for appropriate utilization in multilateral governmental and nongovernmental forums. A portion of the funds would be required for management purposes.

X.1.1 Spatio-temporal Geological Correlation

X.1.1.1 International Geological Correlation Program Coordination
$103,150 1 - a
IGCP coordination; IGCP annual board meeting; cooperation with other organizations such as ICL, Geological Congress; publication of progress reports in the "Geological Correlation" series and the IGCP catalogue and indexes.

X.1.1.2 IGCP Program and New Projects
$147,950 1 - a
Support of IGCP working groups for meetings and publication of results of their work; selection of new IGCP projects (15).

X.1.1.3 Interregional Cooperation and Information Exchange
$83,250 1 - a
Dissemination of IGCP project results; promotion of regional and interregional cooperation.
SUBTOTAL: $334,350

Comment: This subprogram provides support for the IGCP which is conducted jointly with the IUGS. The purpose of the program is to encourage international research on basic geological problems, the identification and assessment of natural resources, and the improvement of the environment. The program is of high interest to members of the U.S. earth sciences community many of whom actively participate in implementing projects and in setting policy directions. Because of the joint character of IGCP sponsorship, U.S. scientists will be able to continue to participate through the IUGS although the United States does expect to continue to be represented on the IGCP Board and its Scientific Advisory Committee. Support for IGCP accounts for only 30% of the program budget despite its high merit. The resources allocated for IGCP project support, in particular, are woefully inadequate (about $150,000 annually) and should be at least three times that amount to be truly meaningful. At a minimum, the 25% of the program costs that may be lost by U.S. withdrawal (about $200,000) should be provided via one of the alternative arrangements.

X.1.2 Geology for Economic Development

$148,850 2 - b/c

Improvement of knowledge about the geological structure and mineral resources of Africa; field work; 3 postgraduate training courses; equipment, publication facilities, and data access for African institutions; participation by African geologists in meetings.

Comment: This subprogram is designed to help developing countries acquire, process and analyze geological data needed to assess their mineral and energy resources and emphasizes the design and operation of computer-based files for geological information. The program is conducted primarily by the Association of African Geological Surveys. There is virtually no U.S. involvement in the planning of the program. The intent of the program is acceptable, but it is flawed by the absence of any scientific guidance. The loss of the U.S. contribution to the program costs (about $70,000) should be provided through one of the alternative arrangements noted above. Consideration could be given to allocating resources to IUGS for the express purpose of providing a scientific advisory mechanism for this program or, alternatively, the funds could be used for the IGCP.

X.1.3 Geology for Land-Use Planning

$24,850 2 - a

Study of selected geological constraints in land-use planning; working groups and symposia; dissemination of findings, including via science films; with UNEP, IAEA, IUGS, and ICL. UNEP: ($200,000)

Comment: This program has addressed such problems as urban land subsidence and the geologic setting of major dams. U.S. participation is limited to occasional consultancies. The program funds that may be lost by U.S. withdrawal (about $12,000) should be provided through one of the alternative arrangements. Additionally, consideration should be given to supporting the IUGS-proposed workshop to be held in Hong Kong on geology for development, the first in what is planned as a series of workshops developed by the IUGS Research and Development Board.

X.1.4 Interdisciplinary Research on the Earth's Crust

$57,450 1 - a

Information exchange through support of meetings held by Lithosphere Commission, two IUGS-affiliated associations (IAGC & IAGOD), and others; support of LDC participants.

Comment: This is a new subprogram and apparently responds to the decision of the recent General Conference to support interdisciplinary research efforts by the Lithosphere Commission, an activity of two ICSU unions (IUGG & IUGS), and by two other IUGS-affiliated associations. This was a welcome decision supported by U.S. scientists. The loss in program funds (about $30,000) should be provided through one of the alternative arrangements. If available, additional resources could be channeled to the IUGS-IUGG Inter-Union Commission on the Lithosphere (ICL).

X.1.5 Processing and Dissemination of Data Relating to the Earth Sciences

X.1.5.1 Remote Sensing Techniques and Data Processing

$65,750 1 - a

Support and development of data processing techniques and of data obtained through remote sensing; cooperation with UN and NGOs such as CODATA (ICSU); meetings, expert missions, model development and testing, training of specialists.

X.1.5.2 Publication of Continental Thematic Maps

$177,350 1 - a

Preparation and publication of continental thematic maps; cooperation with Commission for the Geological Map of the World, INQUA and others; cartographic inventory of Africa.

SUBTOTAL: $243,100

Comment: This subprogram supports earth science information activities, especially geological maps and data acquired through remote sensing techniques. U.S. leadership in remote sensing makes the contributions of U.S. earth scientists eagerly sought by UNESCO. The activities of the Commission for the Geological Map of the World (CGMW), particularly the preparation of small-scale earth science maps, are important; the U.S. contributes heavily and the resulting maps are widely acclaimed and utilized by geologists in U.S. universities and in mineral and exploration companies. Also, there is interest in getting the CGMP to broaden its program to include oceanic areas and geophysical maps. The $120,000 that will be lost in program costs should be provided through one of the alternative arrangements noted above. Any additional resources could be channeled directly to IUGS with the understanding that other concerned bodies, such as CODATA, INQUA and the CGMW should receive funds via IUGS to support their involvement.

X.1.6 Training of Specialized Personnel, With Special Attention to Ensure the Training of Women Specialists

X.1.6.1 Postgraduate Courses in Earth Sciences

$224,600 2 - b/c

Postgraduate courses in earth sciences (21) in both developed and developing countries (none in the United States).

X.1.6.2 Training Seminars in Earth Sciences

$33,450 2 - b/c

Training seminars in earth sciences (4) plus exchanges of teachers "preferably" in developing countries; in collaboration with the Association of Geoscientists for International Development (AGID), International Centre for Geological Training and Exchanges (CIFEG) and others.

SUBTOTAL: $258,050

Comment: The postgraduate courses and training seminars supported under this program have little, if any, U.S. involvement. Unfortunately, no courses are held in the United States. The approximately $130,000 that may be lost in terms of U.S. program support should be provided through one of the alternative arrangements. Additional resources, if available, could be channeled to the geo-unions of ICSU, earmarked for training activities. The United States should be more actively involved in training seminars, for example. Two areas of U.S. expertise in which there is great international interest are publications, especially the editing, processing and publication of maps, and resource assessment.

TECHNICAL COOPERATION PROGRAMS

1. Participation program--help to member states in the organization of meetings and training: $43,400 2 - b/c

2. Extra-budgetary programs: ($1,050,000)
   a) UNDP
   b) Ghana: terminal support for Tarwa School of Mines
      Morocco: development of mining school, Rabat

   b) Regional development banks: ($225,000)

   c) Funds-in-Trust: ($460,000)
      Regional (Africa)--2nd regional training course in mining geology by Norway
      Expected new projects

   d) Associate Expert Scheme: ($90,000)

X.2: Natural Hazards

	Biennial ($000)	Annual ($000)
Regular Program	$1,893	$ 947
of which staff and indirect costs	1,281	641
of which project costs	612	306
Regular program and overhead (64.3%)	3,111	1,555
Other sources	668	334

Overall comment on X.2: This is an important program of direct benefit to the United States in terms of access to territories and information about natural hazards that could be useful if and when similar events occur within the United States. UNESCO, as an intergovernmental agency, provides a useful channel for data exchange and access to first-hand monitoring, assessment, and mitigation efforts within other countries.

U.S. experts in hazard assessment and risk mitigation are frequently utilized and there is a focus on the development of modern equipment and instrumentation. The possible loss in program support due to U.S. withdrawal is about $250,000; if overhead charges are included, the loss may be on the order of $400,000. Given the value of the program, U.S. support of $500,000 is suggested.

Alternative Option 1: Provide the U.S. contribution to program costs (project plus staff), $250,000 through the Funds-in-Trust or donations arrangement, with the remaining amount of U.S. funds, $250,000, for cooperating intergovernmental (e.g., UNDRO) and/or nongovernmental (e.g., IUGS and IUGG) organizations, on the recommendation of a designated U.S. national agent such as the U.S. Geological Survey, possibly with advisory services from the nongovernmental sector.

Alternative Option 2: Invite ICSU and/or IUGS to act as agent for the disbursement of U.S. funds, based on the advice and guidance of a designated U.S. group. Management (i.e., overhead) charges would need to be negotiated at both the national and international level.

Alternative Option 3: Provide the totality of funds ($500,000) to a national agent, such as the U.S. Geolgical Survey, to manage, utilizing alternative multilateral organizations as well as bilateral arrangements as appropriate.

X.2.1 Development of Scientific and Technical Knowledge with a View to a Better Assessment of Natural Hazards to Their Prediction

$132,250 1 - a

Technical studies with UNDRO; special study of seismic risks with UNDRO (seminars, meetings, field missions); evaluation of earthquake prediction techniques and networks; study of seismotectonic synthesis, seismic zoning, and volcanic risk; analysis of historic data on major earthquakes and volcanoes, and floods and droughts; expert training program with International Seismological Centre (ISC); a seismology seminar in the Arab States and in S.E. Asia; cooperation with NGOs.

Comment: The activities within this subprogram are aimed at enhancing scientific knowledge of natural hazards such as earthquakes, volcanic eruptions, floods and landslides, through increased international coordination and data exploitation leading to improved monitoring and prediction capabilities. The program is considered to be of high quality and involves a large number of experts throughout the world. U.S. experts are frequently utilized. The program is of direct benefit to those who live in hazard-prone areas. The opportunity to learn about the causes and effects of hazards, and options for mitigation of risk is important. There is no real alternative organization to UNESCO in this area. Nonetheless, at a minimum, the potential loss of the U.S. contribution to the program costs (about $70,000) should be made available through one of the alternative arrangements, noted above.

X.2.2 Mitigation of Risks Arising from Natural Hazards

$153,850 1 - a

Reorganization of operating procedures of International Advisory Committee on Earthquake Risk in cooperation with UNDRO; multidisciplinary studies on mitigation (working meetings and seminars: two on the Balkans and one each in Africa and Latin America); study of an international mobile monitoring system of volcanic activity in cooperation with UNEP, UNDRO, World Organization of Vulcanological Observatories, and two ICSU/IUGG associations: IASPEI and IAVCEI; mitigating climatic hazards, recommendations on preparing civil engineering codes and improvement of low-cost housing programs in earthquake-prone LDCs and preparation of seismic engineering manual; Andean region seminar on methods of earthquake-resistant construction; 7 postgraduate fellowships; public information project in Asia; study missions at request of Member States to assist with preparatory and rehabilitation measures before and after disasters.

Comment: The objectives of this subprogram are to promote studies of natural hazard warning systems and to decrease human and material losses resulting from natural disasters. The UNESCO International Advisory Committee on Earthquake Risk is an important forum for information exchange. Members are appointed by the Director-General and there is presently one U.S. member. If this position is lost following U.S. withdrawal, a form of compensation might be provided by seconding a U.S. person to the UNESCO staff. In this area of activity, UNESCO permits a degree of access to other countries and data that is not easily duplicated. There is no other single alternative organization that offers a comparable alternative mechanism. However, it should be noted that several of the ICSU unions in the geological/geophysical/geographical areas do address problems of natural hazards and support could be provided to enhance these efforts directly. Minimum program support of about $80,000 should be provided through one of the alternative arrangements presented above.

TECHNICAL COOPERATION PROGRAMS

1. Participation program: $19,950 2

2. Extra-budgetary programs: ($284,000)
   a) UNDP: Algeria--seismic microzoning study
      seismological network, Himalayan region

   b) UNDP: ($50,000)

MAJOR PROGRAM X:
THE HUMAN ENVIRONMENT AND TERRESTRIAL AND MARINE RESOURCES

X.3: Water Resources

	Biennial ($000)	Annual ($000)
Regular Program	$5,302	$2,651
of which staff costs	2,891	1,445
of which project costs	2,411	1,206
Regular Program and Overhead (64.3%)	8,710	4,355
Other Sources	5,822	2,911

Overall comment on X.3: This program area involves active participation of U.S. scientists and engineers in important global cooperative observational research activities. It is also a program that provides training and experience to meet the needs of developing countries. The United States has played a leading role in the establishment and implementation of the International Hydrological Program and is currently participating in a large number of IHP activities through the U.S. National Committee on Scientific Hydrology, located in the U.S. Geological Survey of the Department of Interior. Extensive multilateral and bilateral interactions have been promoted and enhanced through this UNESCO program. The United States loses its eligibility to be a member of the Intergovernmental Council and the Bureau of the Council on U.S. withdrawal from UNESCO. It will be possible to provide some leadership, at least in part, to the IHP in the future through U.S. participation in the nongovernmental organizations closely associated with the IHP. This is a valuable program in which the United States would profit from continuing participation. With respect to program X.3 activities, the current U.S. annual contribution to program costs (projects and staff costs) plus overhead is about $1,090,000. It is proposed that international cooperative efforts be supported in the future at a level of $1 million/year.

Alternative Option 1: The record to date of UNESCO management of program VI.3 is acceptable and the preferred option for maintaining interim support for these activities is to provide an annual contribution to UNESCO via Funds-in-Trust for 25% of the regular annual budget of about $2,700,000 (plus about 10% overhead) or $750,000. It is suggested that $250,000 be provided for U.S. backstopping via the U.S. National Committee on Scientific Hydrology. This latter amount would also provide additional support for the participation of U.S. scientists in IHP programs.

Alternative Option 2: It may be possible to support most aspects of the current IHP UNESCO activities at a level of $750,000/year on an interim basis through ICSU and/or one of its associated bodies such as the International Association of Hydrological Sciences (an association within IUGG), or the International Association of Hydrogeologists

(affiliated with IUGS), with the agreement, of course, of these bodies. It is suggested that $250,000/year be provided to the U.S. National Committee on Scientific Hydrology as noted above.

Alternative Option 3: This program, at a level of $1 million/year, in direct support of ongoing and planned IHP activities, could be managed through a U.S. national focal point such as the U.S. National Committee on Scientific Hydrology with possible advisory services from the nongovernmental sector.

X.3.1 Improvement of Understanding of Hydrological Processes

X.3.1.1 Planning and Coordination
$115,050 1 - a
Third-phase (IHP-III) over next 5 years to provide scientific bases for water management; Intergovernmental Council of IHP and Bureau of Council to oversee program implementation; expert groups for studies; strengthening of IHP national committees; linked to other UN agencies and Intersecretariat Group for Water Resources.

X.3.1.2 Hydrological Processes and Parameters
$171,050 1- a
Preparation of management and modeling manuals; contribution to World Climate Program; support of national projects for illustrative value; linked to X.2, X.5, and X.6; urban hydrological processes linked to X.7; periodic publication of "Discharge of Selected Rivers of the World"; cooperation with and assistance to national IHP committees; symposia and workshops.

X.3.1.3 Influence of Man on Water Cycle
$82,500 1 - b
Synthesis of existing knowledge; development of assessment methodology linked to X.6 and X.8; study with UNEP of hydrological indices; symposium; publication of reports; linked to UNESCO/UNEP lithosphere project; monographs.
UNEP: ($175,000)

Comment: This area covers two of the four principal aspects of the IHP, which has identified 18 themes involving a multitude of projects and subprograms. Essential coordination services are provided under the oversight of the IHP Intergovernmental Council and the Bureau of the Council, bodies on which the United States would lose its eligibility to serve. Program costs for central coordination purposes total about $800,000/year--the U.S. share would be $200,000. As a preferred alternative, it is proposed to provide a contribution of $250,000 (including overhead) to an earmarked Funds-in-Trust account. Another option is to invite ICSU and/or one of its associated bodies to manage these resources for the United States. As noted, these options would require oversight by a U.S. body sensitive to U.S. interests, e.g., the U.S. National Committee on Scientific Hydrology, at a level of about $250,000.

X.3.2 Development of Scientific and Technical Knowledge with a View to the Assessment, Planning and Management of Water Resources

X.3.2.1 Methodologies for Evaluation

$51,600 1 - a

Planning and integrated management of water resources; final report on methods and infrastructures; studies and recommendations on optimization techniques; energy policies and water resources; link of IHP theme 4 activities to X.5.

X.3.2.2 Regional Cooperation

$217,900 2 - b

Experts and consultants working out of UNESCO regional offices; seminars in Africa under International Association of Hydrological Sciences and Association of Hydrological Research; technical assistance in hydrological and hydrogeological maps in collaboration with OAU and ECA and in South America, cooperating with regional economic commissions of the UN.

X.3.2.3 Rural Area Problems

$183,700 2 - b

Continuation of 3 major projects; launching of 2 new projects; seminars and training; technical assistance to regional major projects for Africa; cooperation with ECA; Funds-in-Trust (South of Sahara); Latin American and Caribbean project linked to ECLA, OAS, FAO, UNICEF, WHO and UNEP; mass media materials; major Arab project linked to ACSAD.

Comment: These areas are concerned with further implementation of Section III of the overall IHP program, and with a large number of interactions with governmental and nongovernmental organizations in several regions of the world. The simplest and most effective way of supporting this multilateral cooperative work would be provision of the current magnitude of U.S. contribution to Funds-in-Trust at a level of $300,000/year (including overhead). Another option would involve interim management and provision of this level of support ($300,000/year) to related cooperative activities through ICSU and/or one of its associated bodies. Both options would require U.S. oversight, as noted in X.3.1, above.

X.3.3 Training of Specialists, with Special Attention to Ensure the Training of Women Specialists

X.3.3.1 Methodologies

$45,000 2 - b

Training methodologies, public information, scientific and technical information systems; publications on teaching methods with IHP-III; training of specialized personnel; mass media, posters, etc.; preparation of report in cooperation with ILO, FAO, WHO for Natural Resources Committee of ECOSOC linked to International Drinking Water Supply and Sanitation Decade.

X.3.3.2 Postgraduate Training

$262,500 2 - a

For specialists and technicians; network of 25 institutions providing courses of 2-11 months duration; technical assistance for required training and IHP national committees.
UNEP: ($50,000)

Comment: These activities include further implementation of Section IV of the overall IHP and involve educational and training activities, including extensive postgraduate courses, for specialists and technicians in a large number of institutions throughout the world; U.S. institutions are actively involved in this work. A preferred option would involve provision of the current magnitude of U.S. contribution to a Funds-in-Trust account at a level of $200,000/year (including overhead). Another option is provision of this level of support ($200,000/year) to related cooperative activities through ICSU and/or one of its associated bodies. Both options would require U.S. oversight, as noted in X.3.1, above.

TECHNICAL COOPERATION PROGRAMS

1. Assistance for information systems, in-service training, regional publications, follow-up, equipment. $75,800 2 - b

2. UNEP: ($225,000)
   Noted within program activities, above.

3. UNDP: ($1,996,000)
   Continuation of projects in India, Mozambique, Nigeria, Portugal, expected new projects.

4. Funds-in-Trust: ($475,000)
   Regional Africa (south of Sahara) financed by Islamic Call Society; training of hydrology technicians financed by Norway

4. Associated Expert Scheme: ($215,000)

MAJOR PROGRAM X:
THE HUMAN ENVIRONMENT AND TERRESTRIAL AND MARINE RESOURCES

X.4: The Ocean and Its Resources

	Biennial ($000)	Annual ($000)
Regular program	$ 8,084	$4,042
of which staff costs	4,370	2,185
of which project costs	3,714	1,857
Regular program and overhead (64.3%)	13,281	6,641
Other sources	6,490	3,245

Overall comment on X.4: This program has four basic objectives: 1) advance scientific knowledge of the ocean including improved management of both living and nonliving resources, 2) enhance research and training capacities, 3) promote international cooperation in marine research, and 4) foster dissemination of oceanographic data and information. The prime focus is on enhancing the marine science capabilities of the Third World although observational and data exchange activities are critical for all marine science communities. Thus, there is a focus both on basic science and building Third World capabilities in marine science. The prime organ for promoting this program is the Intergovernmental Oceanographic Commission, a semi-autonomous body within UNESCO in which the U.S. plans to retain its membership. Of the UNESCO program managed by the Division of Marine Sciences, 40% has been decentralized to the UNESCO Regional Offices for Science and Technology in Montevideo, Jakarta, New Delhi, Nairobi, and Cairo/Paris. The Division estimates that one-third of the program promotes the global advancement of marine science and two-thirds promotes marine science in developing countries. Both the IOC and the Division work closely with marine science bodies associated with ICSU, as well as various intergovernmental agencies such as WMO, FAO, and UNDP.

Alternative Option: The U.S. contributes about $1.1 million in support of project and staff costs in this UNESCO marine science program. Slightly more than 60% of the expenditure is by the IOC and close to 40% is by the Division of Marine Science. One option in terms of U.S. support for the program is to provide the IOC share of program support to the IOC Trust Fund ($700,000) and the rest as a Funds-in-Trust contribution ($400,000) for the work of the Division of Marine Sciences. Direct contributions via a U.S agency to cooperating organizations, such as SCOR, ECOR, ICES, WMO, FAO, and UNDP, are possible based on the recommendations of U.S. oversight and monitoring groups such as the Panel on International Programs and International Cooperation in Oceans Affairs (PIPICO/OES), NSF, and the NRC Board on Ocean Science and Policy (BOSP). A total program of about $2 million would permit continuation and a slight enhancement of international marine science activities at U.S. direction.

IOC/Trust Fund	$ 700,000
NSF/PIPICO/BOSP	600,000
Funds-in-Trust: Division of Marine Science	400,000
NSF/PIPICO/BOSP	300,000
TOTAL	$2,000,000

X.4.1 Promotion of Scientific Investigation and the Ocean and Its Resources

X.4.1.1 Study of the Role of the Ocean in Climatic Change

$101,900 1 - a

Planning research studies on the role of the ocean in climatic variablity and change; two intergovernmental meetings organized by IOC and annual meetings of the joint SCOR/IOC Committee on Climatic Changes and the Ocean (CCCO); experts meetings on WOCE and on the monitoring system.

X.4.1.2 Studies on Oceans and their Living Resources

$55,950 1 - b

Comparative studies, sponsored by the joint UNESCO/FAO program on ocean science and living resources, in the north and central Atlantic, the Western and Eastern Indian Ocean and the Pacific on economically important fish stocks; research program on nonliving resources implemented by the IOC regional subsidiary bodies, under joint sponsorship of the UN Office for Ocean Economics and Technology.

X.4.1.3 Study and Monitoring of Pollution in the Marine Environment

$116,250 1 - a

Development of the future world marine pollution research and monitoring program (MARPOLMON)--two meetings on methods, standards and intercalibration techniques. Exercise on intercalibration of methods of analysis for trace metals and organochlorines in the North Atlantic. Meetings of the Working Committee on the Global Investigation of Pollution in the Marine Environment (GIPME), and implementation of the GIPME program in cooperation with UNEP, the International Council for the Exploration of the Sea (ICES), the Commission for the Scientific Exploration of the Mediterranean Sea (ICSEM) and the IAEA. Training courses, fellowships, laboratory equipment, and service of experts in GIPME and MARPOLOM programs to developing countries.

SUBTOTAL: $274,100

Comment: This program is conducted completely by the IOC. The annual U.S. share of the program costs (project, plus staff) is about $140,000 and presumably could be provided to the IOC Trust Fund. Substantively,

the program addresses the ocean component of the World Climate Research Program (WCRP) including the design of the World Ocean Circulation Experiment (WOCE), certain tropical studies and ocean monitoring. It is of fundamental interest to the United States. An important part of the planning is done by the Committee on Climatic Changes and the Ocean (CCCO), which is jointly sponsored by IOC and the ICSU Scientific Committee on Oceanic Research (SCOR). Other areas of activity include advancing knowledge of fish stock management and utilization of mineral resources, as well as encouragement of a system for monitoring the marine environment, in which U.S. interest is also high. Additional resources, if available, could be well utilized in this program, particularly for the CCCO which is seriously underfunded by UNESCO through the IOC budget. Regular coordination of activities need to be strengthened as well as efforts to enhance training in instrumentation (e.g., tide gauges for developing coastal states). A U.S. focal point for management of additional resources would be required.

X.4.2 Development of Scientific Knowledge with a View to the Rational Management of Marine Systems

$189,850 (Division of Marine Sciences) 1 - a

Studies on the marine environment and the continental margin; work of Joint Panel in Oceanographic Tables and Standards with ICES, SCOR, and IAPSO; remote sensing studies with ICSU, SCOR and IABO; monographs, keys on fishes, geological maps with CGMW; biological productivity of beaches and continental shelf areas with SCOR and IABO in association with subprogram X.5.1; historical studies; cooperation with IOC and other UN agencies, especially on marine pollution.

Comment: This program is operated by the UNESCO Division of Marine Sciences. The U.S. contribution to the program (project plus staff) is about $100,000. The studies involved are conducted largely by a number of nongovernmental organizations, most of which are associated with ICSU. One option is to contribute the U.S. share of program support through a special donation to UNESCO with additional resources ($75,000) earmarked for direct support of the cooperating nongovernmental and intergovernmental agencies. Another option is to provide the totality of recommended support directly to a single nongovernmental agent, such as ICSU, to manage. Both options would require some U.S. oversight, however. A third option is to provide funds directly to a U.S. agent, such as NSF or NOAA, to manage.

X.4.3 Ocean Services, Provision of Oceanographic Data, Information, Charts and Warnings

X.4.3.1 Development of Integrated Global Ocean Services System (IGOSS)

$55,300 1 - a

In cooperation with IOC and WMO, the development of IGOSS activities through meetings of experts.

X.4.3.2 Development of the Tsunami Warning System in the Pacific

$40,650 1 - b

Activities of the International Coordination Group for the Tsunami Warning System in the Pacific including annual meeting in U.S. in 1984; coordination with Program X.2; missions to countries of the Pacific to advise on national warning systems, meetings.

X.4.3.3 Ocean Mapping

$48,150 1 - a

Meetings of the Joint IOC/IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), other meetings of experts for the preparation of atlases.

X.4.3.4 Development of the International Oceanographic Data Exchange

$82,250 1 - a

IODE meetings on new data collection systems; exchange of oceanographic data; development of data centers; meeting of Joint FAO/IOC/UN Experts on the Aquatic Sciences and Fisheries Information System (ASFIS).

X.4.3.5 Dissemination of Oceanographic Research Results

$57,400 1 - a/b

Publications on oceanographic research; newsletter with UN, FAO, IMO and WMO; technical papers; cooperation with FAO on ASFIS publications.

SUBTOTAL: $283,750:

$226,350 (IOC)
52,100 (Division of Marine Sciences)
5,300 (Other)

Comment: Data on subsurface ocean temperatures and salt content obtained by merchant and research ships of many nations are collected and transmitted through IGOSS; only a small fraction is obtained by U.S. ships. The IGOSS is of value but it needs improvement and expansion of coverage, particularly in the developing world. The IODE is important as a source of foreign marine data through the World Data Center (oceanography) programs, especially in terms of access to Soviet data through WDC-B located in Moscow. All programs except 4.3.5 are conducted by the IOC. U.S. support of these IOC activities is about $120,000 (project plus staff) and could be provided directly to the IOC Trust Fund; about $30,000 might be provided to the Division of Marine Sciences as a donation or contribution. Additional resources might be allocated to cooperating UN agencies based on recommendations of a U.S. agent such as PIPICO.

X.4.4 Strengthening of National and Regional Capacities for Marine Research, Ocean Services, and Training

X.4.4.1 Development of Marine Science and Technology Infrastructures

$329,100 2 - b

Training programs, workshops, consultants, technical assistance. Latin American and Caribbean cooperation with IOCARIBE and the UNEP Action Plan for the Wider Caribbean; in Asia and the Pacific: regional Mangrove Project cooperation with IOC and UNDP; in Africa: cooperation with UNEP Regional Seas Program, network of tide gauges for climate change studies; cooperative activities with Arab Council for the Marine Environment of ALESCO.

X.4.4.2 Training of Scientific and Technical Personnel

$136,350 2 - b

Fellowships for 6-9 months duration for study in physical, chemical, geological and biological oceanography and ocean engineering; workshop on marine science curricula; regional meeting on university ocean engineering curricula in Latin America in cooperation with Engineering Committee on Ocean Resources (ECOR).

X.4.4.3 Training, Education and Mutual Assistance in Marine Sciences (TEMA)

$108,200 2 - b

Enhance marine science capabilities of developing countries; workshops; consultants to help prepare Marine Science Country Profiles and development of national marine science policies.

X.4.4.4 IOC Ocean Science Programs and Ocean Services Activities

$215,800 1 - b

Assistance to developing countries to participate in IOC training seminars, workshops; interregional activities and cooperation; provision of experts at meetings.
Voluntary contribution (IOC Trust Fund): ($175,000)

SUBTOTAL: $789,450:
$324,000 (IOC)
199,900 (Division of Marine Sciences)
265,550 (Other)

Comment: This program is focused on technical training activities and helping the developing countries to enhance their marine science capabilities. Much of the work is undertaken regionally. It appears that IOC activities in this area are not well advanced. The UNESCO regional offices are apparently active in this area, and maintain liaison with the UNESCO Division of Marine Sciences. This program could be especially strengthened in Latin America and the Caribbean. One option is to make a grant of $175,000 to the IOC Trust Fund and a donation or contribution for the Division's activities of $100,000. Additional resources could be made available through UNDP. Also, support is suggested for a TEMA (Training, Education, and Mutual Assistance) management mechanism in the United States to promote technical assistance through, for example, the Agency for International Development.

X.4.5 Strengthening of International Oceanographic Cooperation and Formulation of Intergovernmental Policies

X.4.5.1 Governing Bodies and Secretariat Services of IOC
$123,450 1 - a
Meetings of the IOC Executive Council; missions of officers and IOC; publications for specialists and general public illustrating activities of IOC.

X.4.5.2 Regional Subsidiary Bodies of IOC
$74,550 1 - b
Meeting of regional subsidiary bodies of IOC.

X.4.5.3 Scientific and Technical Support for the IOC Program
$67,200 1 - a
Advisory support to IOC by nongovernmental organizations, such as SCOR, ECOR, IABO, and Permanent Service for Mean Sea Level (PSMSL).

SUBTOTAL: $265,200

Comment: This section of the IOC program covers meetings and other administrative expenses for the IOC secretariat. Support is also provided to nongovernmental advisory bodies such as SCOR. A contribution to the IOC Trust Fund in the amount of $150,000 would cover the U.S. share of program costs (project plus staff). Additional funds could be allocated directly to SCOR and to the other cooperating bodies via NSF based on recommendations of a national (U.S.) body such as PIPICO or BOSP.

TECHNICAL COOPERATION PROGRAM

1. Training, fellowships, grants: $54,650 2 - b

2. Development projects: ($1,000,000)
UNDP, Burma, Cuba, Egypt, Greece, Mexico, Thailand, Uruguay, expected new project.

3. UN Financing System for Science and Technology for Development: ($250,000)
Madagascar, expected new projects.

4. UN Environment Programme: ($225,000)
Regional (Africa), Cuba, expected new projects.

5. Islamic Development Bank: ($325,000)
Yemen

6. Funds-in-Trust: ($1,155,000)
For Burma (from Norway), Iraq, Oman, Qatar, for IOC (from Japan)

7. Associate Experts Scheme: ($90,000)

X.5: Management of Coastal and Island Regions

	Biennial ($000)	Annual ($000)
Regular program	$2,651	$1,326
of which staff costs	1,849	925
of which project costs	802	401
Regular program and overhead (64.3%)	4,355	2,176
Other sources	999	500

Overall comment on X.5: The objective of this program is to promote effective management of coastal and island zones and to aid in resource preservation. Most of the activities are a part of the MAB program; the remainder are conducted by the Division of Marine Sciences. Activities include pilot projects, training and workshops. There is substantial involvement by UNEP, FAO, and WHO as well as SCOR and IABO. Program support (project plus staff) of about $300,000 is suggested as a contribution to UNESCO (Funds-in-Trust, donations) and by an appropriate national focus: USMAB - $100,000 and NSF/PIPICO - $100,000 for a total support package of $500,000.

X.5.1 Development of Syntheses of Knowledge Relating to Interactions between Terrestrial and Marine Environements in Coastal and Island Systems

X.5.1.1 Interdisciplinary Research Projects 1 - b
$53,450
Nine interdisciplinary research projects undertaken regionally and six pilot projects with UNDP and UNEP.

X.5.1.2 Study of Coastal and Island Systems
$45,250 1 - b
International studies with IABO and SCOR; Mediterranean regional MAB activities; SCOR/UNESCO panel on coastal systems.

SUBTOTAL: $98,700

Comment: This program comprises a series of regionally based research projects, some of which are in collaboration with UNDP and UNEP, and some coastal systems studies with SCOR and IABO. The U.S. share of the activities is in the range of $25,000. A donation or contribution to UNESCO may be possible or a U.S. agent, such as NSF/PIPICO, could manage them.

X.5.2 Establishment of the Basis for the Integrated Management of Coastal Zones

X.5.2.1 Study on Coastal Zone Development
$60,800 2 - b
Survey of status of coastal zone development in developing countries; consultant missions and workshops; cooperation with X.3.

X.5.2.2 Pilot Projects for Integrated Management
$36,500 1 - b

SUBTOTAL: $97,350

Comment: This program is a mixture of activities, some conducted by the Division of Marine Sciences and some within the MAB program. A direct donation or contribution to UNESCO to make up the U.S. share of program support, plus resources for USMAB, are suggested.

X.5.3 Integrated Management of Islands

X.5.3.1 Pilot Projects on Intergrated Research
$71,600 1 - b
Multidisciplinary studies on regional basis with X.6; management of island environments and land-use planning in three regional stations with MAB national committees and UNEP.

X.5.3.2 Dissemination of Management Data
$34,100 1 - b
Dissemination of data on management of island systems within MAB framework; report on population environment/resource interaction with UNEP and UNFPA; training and handbook.

SUBTOTAL: $105,700

Comment: These activities are within the MAB program. Alternative arrangements might include a direct donation to UNESCO plus support for USMAB to provide oversight and to enhance U.S. involvement.

X.5.4 Training of Specialists
$55,950 2 - b
On-site training of specialists and managers; postgraduate training; advanced training in ecology of coastal and brackish water in MAB context; short courses.

Comment: The majority of these activities are a part of the MAB program; only a small portion are conducted through the Division of Marine Sciences. A direct contribution to UNESCO plus support for USMAB is one way to assure U.S. involvement. Enhanced utilization of U.S. universities and scholars to assist with training scientists of the Third World could be fostered.

TECHNICAL COOPERATION

1. Fellowships, grants: $43,250 2 - b

2. UNDP: ($374,500)
   Asia and Pacific mangroves

3. UNEP: ($125,000)
   Regional (Africa) expected new projects

MAJOR PROGRAM X:
THE HUMAN ENVIRONMENT AND TERRESTRIAL AND MARINE RESOURCES

X.6: Land-Use Planning and Terrestrial Resources

	Biennial ($000)	Annual ($000)
Regular program	$3,807	$1,904
of which staff costs	1,875	938
of which project costs	1,932	966
Regular program and overhead (64.3%)	6,254	3,127
Other sources	4,306	2,153

Overall comment on X.6: This area of acticity, directed towards applied research on natural resources management and the dissemination of practical results, is the centerpiece of the Man and the Biosphere (MAB) Program. MAB includes many activities initiated by the U.S. scientific community. The USMAB Secretariat and scientific advisory apparatus should continue to provide intellectual and managerial guidance. There are four levels of concern: (1) that the USMAB Secretariat and support structure be on a sound footing; (2) that the international (UNESCO) MAB Secretariat be provided managerial support and leadership from the U.S. scientific community; (3) that quality projects within the current program area be reinforced with U.S. funding as may be necessary due to constraints on resources resulting from the withdrawal of U.S. overall support of UNESCO beginning in 1985; and (4) that within the overall MAB program, catalytic support be provided to innovative U.S. longer-term initiatives to achieve MAB objectives.

USMAB must be assured adequate support on a continuing basis as an *a priori* condition for consideration of contributions to international Man and the Biosphere activities. Resources are need to help ensure participation and leadership of the U.S. scientific community in these important global observational activities. A USMAB secretariat backed up by adequate scientific advisory support is a requirement for managing and overseeing the interim alternative mechanisms proposed in this assessment. USMAB should also provide encouragement and support to the development of innovative interdisciplinary contributions to new programs such as the one on global change currently being considered by ICSU.

With respect to program X.6 activities, the current U.S. annual contribution to program costs, including overhead, is approximately $800,000/year. The U.S. share of project/staff costs without overhead is about $500,000. This amount could be provided to UNESCO through Funds-in-Trust, donations, etc.

Alternative Option 1: Assuming that recent decisions within UNESCO to significantly improve overall MAB management are successfully implemented, the most efficient and effective means to support the program would be through an annual contribution to UNESCO (Funds-in-Trust, donations, etc.) of $500,000 including overhead. In addition, it is

recommended that a U.S. science administrator be seconded to the UNESCO MAB secretariat ($150,000/year) and that $450,000 be provided USMAB for program planning, new initiatives, and staff and overhead costs. This would total $1.1 million.

Alternative Option 2: Support of international MAB activities could be provided totally through USMAB ($950,000). Secondment of a U.S. science administrator plus administrative support to the UNESCO staff ($150,000) is also recommended. The total is $1.1 million/year.

X.6.1 Promotion of International and Interdisciplinary Cooperation in the Field of Land-Use Planning and Terrestrial Resources

X.6.1.1 MAB Coordination
$104,500 1 - a
Coordination of activities under 14 research themes; cooperation with UNEP, FAO, WHO, WMO, UNU; support of NGOs (ICSU, IUCN, IUFRO, SCOPE, IGU); work of MAB Council and MAB Bureau.

X.6.1.2 Promotion of National Activities and Regional Cooperation
$41,900 1 - a
Strengthen national MAB committees; evaluation criteria; consultant services.

Comment: This section covers overall management of MAB. Since on withdrawal from UNESCO the United States would lose official status on the International Coordinating Council (ICC) as well as eligibility to serve on the bureau as one of the four vice presidents, consideration should be given to seconding a U.S. scientist to UNESCO to assist in the direction of the program (est. cost: $150,000/year).

Alternative Option 1: With respect to UNESCO program costs (project and staff costs, but not overhead), it is recommended that discretionary funds be provided to UNESCO to coordinate and assist national MAB committees. The provision of a U.S. contribution (approx. $100,000/year) to UNESCO (Funds-in-Trust, donations, etc.) plus $100,000 to USMAB for cooperative land-use planning activities would total $200,000.

Alternative Option 2: Provision of the same amount of support ($200,000) to USMAB for collaborative projects with UNEP, ICSU, and the International Union for the Conservation of Nature and Natural Resources (IUCN).

X.6.2 Intergrated Land-Use Planning and the Utilization of Resources in Humid and Subhumid Tropical Regions

X.6.2.1 Pilot Research Projects
$100,150 1 - a
Practical land-use planning, and management of resources in humid and subhumid tropical zones; 12 projects plus new pilot

projects (e.g., energy, ecology, hydrology) linked to IHP and biosphere reserves; dissemination of research results linked to interests of FAO, World Bank, UNEP, WHO, WMO; joint efforts with UNEP, IUCN, WWF, Global Forest Fund (Jaycees International).
UNEP Fund: ($200,000)

X.6.2.2 Comparative Studies
$35,700 1 - b
Studies and summaries on tropical ecology; cooperation with NGOs, seminars, link to applied microbiology and biotechnology, IUBS, IUFRO.

X.6.2.3 Training in Ecology, Land-Use Planning
$58,950 1 - b
Training in tropical zones coordinated with international bioscience networks, ICSU; FAO (ICRAF).
Funds-in-Trust: ($250,000)

Comment: This is an area of interest to the United States; projects appear to have been well-designed and implemented.

Alternative Option 1: An efficient means of maintaining current support of program costs (project, staff costs) at a level of $100,000 would be through a contribution to UNESCO (Funds-in-Trust, donations, etc.). Additional resources should be made available to USMAB for the support of international activities in this area ($100,000). The total is $200,000.

Alternative Option 2: Provision of the same amount of support ($200,000) to USMAB. These funds would be used for grants to selected projects, such as those in Indonesia and Venezuela. Grants to U.S. professional institutions might also be considered. This option would require strengthening the USMAB Secretariat.

X.6.3 Integrated Management and Rural Development of Arid and Semi-Arid Zones

X.6.3.1 Networks of Pilot Projects
$102,000 2 - a
Coordinated pilot research projects in arid and semiarid zones; 4 regional networks of research and training projects; cooperation with biosphere reserves, UNEP, IUCN; links to FAO, UNSO, WMO.
UNEP extension activities: ($75,000)

X.6.3.2 Use and Circulation of Research Findings
$51,550 2 - a
Demonstration courses; provide research results to rangeland congress, conference on arid lands.

X.6.3.3 Training in Integrated Management
$39,000 2 - b
Desert and semiarid zones; cooperation with FAO, UNEP, UNSO, Institut du Sahel, etc.

Comment: This is an area of primary benefit to developing countries and of fairly high value as far as design and performance is concerned. The United States benefits from cooperative exchanges and the provision of data and results from other countries' research: Sahel, China, USSR, etc.

Alternative Option 1: As noted in the previous item, support of program costs (projects, staff) could be provided through a contribution to UNESCO (Funds-in-Trust, donations, etc.) at a level of $100,000/year. Additional resources should be made available to USMAB for the support of international activities in this area ($100,000). The total is $200,000.

Alternative Option 2: This same level of support could be provided directly under USMAB oversight to selected projects under bilateral arrangements involving U.S. professional institutions; total $200,000.

X.6.4 Integrated Land-Use Planning and Continuous Monitoring in the Temperate and Cold Zones

X.6.4.1 Cooperation at Subregional Level
$43,750 1 - b
Scientific cooperation within temperate and cold zones; networks; cooperative project grants.

X.6.4.2 Environmental Implications
$35,700 1 - c
Industrialization and intensification of agriculture; ecological effects of pollutants, engineering works, etc.

X.6.4.3 Monitoring Long-Term Environmental Change
$25,250 1 - a
Baseline (e.g., desert spread, acid rain) areas; cooperation with UNEP, WHO, WMO.
UNEP: ($50,000)

Comment: Projects of subprograms 6.4.1 and 6.4.3 are valuable and of direct interest to U.S. scientists.

Alternative Option 1: Support of the U.S. share of program costs for selected projects could be provided at a level of $50,000/year to a UNESCO Funds-in-Trust account. Additional resources should be made available to USMAB for the support of international activities in this area ($50,000); total $100,000.

Alternative Option 2: This same level of support could be provided to selected project areas through USMAB oversight of grants to professional institutions ($100,000).

X.6.5 Training of Specialists and Technicians, with Special Attention to Ensure the Training of Women Specialists, and Testing of New Systems of Instruction in Land-Use Planning

X.6.5.1 Postgraduate Training Courses
$67,950 2 - c
Up to 5 medium duration courses.
UNEP: ($75,000)

X.6.5.2 Seminars
$72,900 2 - a
Short postgraduate courses; 10 new courses in cooperation with regional centers.

X.6.5.3 Institutional Improvement
$46,900 2 - a
Research and training facilities; consultant services, teaching materials to national institutions.

Comment: Of primary interest to developing countries. High-value projects (6.5.2 and 6.5.3) could be supported through Alternative Option 1 by a contribution to UNESCO (Funds-in-Trust, donations, etc.) of $100,000 plus resources to USMAB for collaborative international activities, $100,000; total $200,00. Alternative Option 2 provides this same level of resources ($200,000) to USMAB for international activities in this area.

X.6.6 Dissemination of Information on the Various Aspects of Land-Use Planning and Innovations in this Field

X.6.6.1 Land-Use Planning Results
$64,950 1 - a
Dissemination of MAB research results in land use planning; MAB INFO system; educational material on resource management; directory of scientists; reports; regional newsletters.

X.6.6.2 Publications
$15,700 2 - b
Methods for integrated resources planning.

Comment: This is an area of value to U.S. scientists as well as developing countries.

Alternative Option 1: Provision of current U.S. share of program costs (estimated at $50,000/year) through the UNESCO Funds-in-Trust or donations arrangement.

Alternative Option 2: Provision of this same level of resources through USMAB.

TECHNICAL COOPERATION PROGRAMS

1. Research, Training, Information Activities: $58,500 2 - c
   Comment: No additional support is recommended, included in the above.

2. UNDP: ($240,500)
   Sahel pastoral development, training

3. UN Sudano-Sahelian Office (UNSO): ($236,500)
   Desertification control

4. Funds-in-Trust: ($700,000)
   Kenya arid land research station by Federal Republic of Germany; new projects

5. Associate Expert Scheme: ($325,000)
   Provision of experts to operational projects by Member States.

X.7: Urban Systems and Urbanization

	Biennial ($000)	Annual ($000)
Regular program	$1,846	$ 923
of which staff costs	995	498
of which project costs	851	425
Regular program and overhead (64.3%)	3,033	1,517
Other sources	708	354

Overall Comment on X.7: This program area is largely directed toward the needs of rapidly evolving, large urban conglomerations, particularly those of economically evolving countries. However, projects are uneven in quality. It is recommended that U.S. support and participation be monitored by USMAB and/or an appropriate U.S. body sensitive to U.S. interests. The same caveats prevail as noted under program X.6. This is a potentially valuable program. Therefore, it is recommended that resources be allocated for support of urban MAB activities at a level of $300,000/year within a total X.6-9 budget of some $2 million.

Alternative Option 1: An efficient means of providing support and encouragement for selected activities falling under subprogram X.7.1 ($70,000/year) and X.7.2 ($30,000/year), totaling $100,000, would be through a contribution to UNESCO (Funds-in-Trust, donations, etc.). Additional support for these activities at a level of $200,000 is proposed through USMAB administered international activities. Total proposed support in this area is $300,000/year.

Alternative Option 2: Support of MAB/urban activities at a level of $300,000/year to be administered by USMAB.

X.7.1 Planning and Integrated Management of Urban Systems as Ecosystems

X.7.1.1 Pilot Projects

$78,900 2 - b

Urban systems pilot projects in different biogeographical regions; 6 pilot projects in 4 regions; collaboration with UNEP; links to Habitat, WHO, IFIAS, IFLA, IHP.

UNEP: ($50,000)

X.7.1.2 Technical Information Exchange

$52,200 2 - b

Urban and land-use planning; regional seminars, documents.

UNEP: ($25,000)

Comment: This is a useful area of primary benefit to developing countries. Support of projects and training could be provided under Alternative Option 1 on a selected basis through contributions to UNESCO (Funds-in-Trust, donations, etc.) at a level of $70,000 to cover current U.S. annual contributions for program costs. It would be possible to provide such support through USMAB administered international arrangements (Alternative Option 2). In both alternatives, there is an opportunity to provide for significant multilateral activities at a level of $100,000/year through USMAB resources.

X.7.2 Training in the Planning and Management of Urban Systems

X.7.2.1 Training of Urban Managers and Planners

$62,350 2 - b

Regional courses, booklets.

UNEP: ($25,000)

X.7.2.2 Information Exchange

$108,800 2 - c

Training in town planning and architecture; collaboration with International Union of Architects; UNESCO Prize.

UNEP: ($25,000)

Funds-in-Trust: ($125,000)

Comment: This is also an area of primary benefit to developing countries and consideration should be given to providing selective support to program 7.2.1 through Alternative Option 1, as a contribution to UNESCO (Funds-in-Trust, donations, etc.) at a level of $30,000/year to cover current U.S. contributions to program costs. A good Alternative Option 2 is to provide this level of support to selected related projects through bilateral arrangements managed by USMAB. In both alternatives, it is proposed that USMAB manage additional international activities at a level of $100,000.

X.7.3 Promotion of Public Awareness of the Problems of Urbanization

X.7.3.1 Public Participation
$32,000 2 - c
Environment for living pilot project.

X.7.3.2 Future of Habitat and Environment
$33,200 2 - c
Studies and regional seminars.
UNEP: ($25,000)
Habitat: ($25,000)

Comment: This is an area of unknown quality. No additional support is recommended.

TECHNICAL COOPERATION PROGRAMS

1. Research, training, information activities: $115,700 2 - c
   Comment: No additional support is recommended.

2. UNEP: ($175,000)

3. Habitat: ($25,000)

4. Funds-in-Trust: ($125,000)

5. Associate Expert Scheme: ($54,000)
   Provision of expert to MAB secretariat by member country.

X.8: The Natural Heritage

	Biennial ($000)	Annual ($000)
Regular program	$1,145	$ 573
of which staff costs	641	321
of which project costs	504	252
Regular program and overhead (64.3%)	1,881	941
Other sources	2,228	1,114

Overall Comment on X.8: This high-quality program area covering the Natural Heritage is of direct interest to the U.S. scientific and environmental community and concerns the elaboration and coordination of a global network of biosphere reserves. It is a program receiving support from the World Heritage Fund and UNEP at a level about two times the regular UNESCO budget. The same caveats prevail for overseeing these activities as noted under program X.6.

Alternative Option 1: Contribute $150,000/year to UNESCO (Funds-in-Trust, donations, etc.) to cover current U.S. share of program costs. This important area should be provided additional support through international cooperative projects at a level of $150,000 under USMAB oversight.

Alternative Option 2: Under the supervision of USMAB, support ($300,000/year) could be provided to project activities through nongovernmental professional organizations including particularly the International Union for the Conservation of Nature and Natural Resources (IUCN). A third alternative would include provision of this resource level as a special contribution to the World Heritage Fund.

X.8.1 Establishment of Systematic Inventories of the Natural Heritage and Research Concerning its Preservation

X.8.1.1 Systematic Inventories

$27,100 1 - a

Monitoring of representative ecological areas to determine global trends; research on conservation of genetic material; biosphere reserve network; technical assistance to national MAB committees; cooperation with Ecosystem Conservation Group (UNEP, IUCN, FAO); MAB Technical Notes.

UNEP: ($50,000)

Comment: This is an area of direct interest to U.S. scientists. Discretionary funds are required by the central MAB secretariat to cover current U.S. contributions. These could be provided through UNESCO Funds-in-Trust, donations, etc., or alternatively through USMAB working closely with the World Heritage Fund.

X.8.2 Preparation and Application of International Instruments for the Preservation and Enhancement of the Heritage

X.8.2.1 World Heritage Convention

$21,200 1 - a

International instruments; collaboration with World Heritage Committee, IUCN; World Heritage List.

World Heritage Fund: ($500,000)

X.8.2.2 International Instruments in Natural Heritage

$12,000 1 - b

Comment: This is also an important item. The United States could cover its share of program costs by providing support through UNESCO (Funds-in-Trust, donations, etc.), or through USMAB working closely with the World Heritage Fund.

X.8.3 Development of the International Network of Representative Ecological Areas

X.8.3.1 Development of Biosphere Reserve Network
$73,300 1 - a
New reserves; assistance to states; international soil museum; monitoring.
UNEP: ($155,000)

X.8.3.2 International Cooperation in Biosphere Networks
$34,950 1 - a

Comment: This is a significant item for the United States. Particular attention should be devoted to supporting the development of biosphere reserve networks.

X.8.4 Training of Specialists, with Special Attention to Ensure the Training of Women Specialists
$53,300 2 - a
Technical assistance; regional training centers; collaboration with World Heritage Fund, UNEP.
World Heritage Fund: ($250,000)
UNEP: ($105,000)

Comment: This is an item of significant benefit to the developing world; high-value training activities could be supported on a selective basis through Funds-in-Trust or bilateral arrangements managed by USMAB as a second alternative option.

TECHNICAL COOPERATION PROGRAMS

1. Research, training, information activities: $28,350 2 - b
   Comment: included under comment X.8.4, above.

2. World Heritage Fund: ($750,000)

3. UNEP: ($310,000)

4. Associate Expert Scheme: ($54,000)

X.9: Environmental Education and Information

	Biennial ($000)	Annual ($000)
Regular Program	$2,208	$1,104
of which staff costs	1,401	701
of which project costs	807	403
Regular program and overhead (64.3%)	3,627	1,814
Other sources	1,280	640

Overall Comment on X.9: This program area, including environmental education and information, contains a mixture of activities of varying quality, yet all potentially useful. These activities are largely directed towards producing practical resource management information for developing countries through projects pertaining to communications and publication of research results. Some of these activities are of interest to the United States.

Alternative Option 1: Provide the U.S. share of support for selected activities ($150,000) to UNESCO through Funds-in-Trust, donations, etc., plus an additional $150,000 to USMAB; total $300,000.

Alternative Option 2: Provide support ($300,000) through USMAB to U.S. institutions and nongovernmental organizations.

X.9.1 Production and Dissemination of Scientific Information on the Environment

X.9.1.1 Dissemination of Technical Information

$78,700 — 1 - a

Communication of research results and technical information to policy makers and users; expanded poster exhibit in cooperation with ICSU/CTS; support to MAB national committees for translations; support to MAB field projects for preparation of information; preparation of teaching materials.

X.9.1.2 Land-Use Research Results for Decision Makers

$26,550 — 2 - b

Presentation of results to deal with practical problems of managing natural resources; use of research sites and biosphere reserves for demonstration purposes.

X.9.1.3 Teaching Materials

$19,000 — 2 - b/c

Experimental teaching material for general environmental education; dissemination through information and innovation networks of UNESCO; linked to program V.2.

X.9.1.4 Publication of "Nature and Resources"

$104,600 1 - b

Quarterly bulletin in English, French and Spanish; co-publication in Russian; provides information on MAB, IHP, and IGCP.

X.9.1.5 Educational Films on Environment

$8,000 2 - c

In conjunction with MAB program and in cooperation with Habitat exchange and distribute films relating to International Year of Shelter for the Homeless (1987); film competition among LDC film-makers.

Habitat: ($25,000)

Comment: This area includes a mixture of information dissemination activities, all potentially valuable but some of poor quality. Projects of value to U.S. interests are contained in X.9.1.1 and X.9.1.4; those of value to developing country interests are in X.9.1.2.

Alternative Option 1: Since this centrally coordinated activity requires discretionary funding, consideration should be given to provision of $150,000 for earmarked activities to UNESCO through Funds-in-Trust, donations, etc.. An additional $150,000 should be provided USMAB to support international activities directed towards development of educational materials. The total is $300,000.

Alternative Option 2: Provide $300,000 to USMAB for U.S. participation in multilateral environmental education activities.

X.9.2 Development of General Environmental Education

X.9.2.1 Pedagogical Research

$10,550 2 - c

Exchanges of information and experimental data; pedagogical research and experiments; newsletter "Connect"; symposia, regional seminars on inclusion of environmental education in university courses.

X.9.2.2 Pedagogical Materials

$22,250 2 - c

Promotion of research and experimentation; pedagogical materials at all levels linked to IV.2, V.2, V.5.1, V.3.3; mass media.

X.9.2.3 Training Activities

$32,150 2 - c

Training of teaching, administrative and technical staff linked to II.3.2, IV.3, V.3.3 and V.5; national and regional in-service seminars; preparation of courses for in-service training.

X.9.2.4 Adaptation of Education Materials

$21,050 2 - b

Preparation and adaptation of educational material; content and methodology manuals translated into official languages; general environmental education module; audio-visual materials linked to II.3.2 and II.5.2; module for training education planners.

X.9.2.5 Regional Cooperation

$22,950 2 - c

Regional and international cooperation; technical support through regional offices; consultation with international institutions.

Comment: This area of current limited value should be strengthened to provide "users" with information on resource management. Consideration could be given to covering the current U.S. contribution for these activities (X.9.2.4) through Funds-in-Trust. Alternatively, a second channel would involve providing support for selected parallel projects under the oversight of USMAB. The amount is included under options noted above for X.9.1.

X.9.3 Promotion of Awareness of Environmental Problems in Vocational Training

X.9.3.1 Administrators

$22,650 2 - c

Promotion of awareness in administrators and economists; meeting of experts; preparation of training syllabuses.

X.9.3.2 Engineers

$21,550 2 - c

Promotion of awareness in engineers of environmental issues.

Comment: No provision of resources is recommended.

TECHNICAL COOPERATION PROGRAMS

1. Research, training, and information activities: $13,350 2 - b
   Comment: Provision of U.S. support included under X.9.2.5, above.

2. UNDP: ($615,000)
   Joint implementation of International Environmental Education Program; production of educational materials.

SCIENCE ACTIVITIES FROM OTHER MAJOR PROGRAMS

Although the purview of this assessment centered on Major Programs VI, IX, and X, there are certain activities in other Major Programs of interest to U.S. scientists and engineers. A brief commentary on three specific activities is provided, but it must be emphasized that it is necessarily not as detailed as that provided for the major programs in the report itself. Activities included here are:

- Scientific and Technological Information: Major Program VII (in part)
- Teaching of Science and Technology (secondary school level): subprogram V.2
- Statistics on Science and Technology: General Activities, Chapter 2

Budgetary considerations for these activities are not included in the overall discussion of programs and budgets at the beginning of Chapter 4 of the NRC report.

UNESCO's Program on Scientific and Technological Information

Assessment/Potential Impacts

UNESCO's concern for development of scientific and technological information services and networks goes back about 15 years to the establishment of the UNISIST Program, largely a U.S. initiative. Current UNISIST activities are contained within the General Information Program (PGI) which is described in Major Program VII. The United States is a member of the 30-country Intergovernmental Council for the General Information Program. Overall Program VII activities, including overhead, are budgeted at a level of $10 million per year; regular program costs are about $6 million per year. Funding from "outside" sources totals about $3.5 million per year.

The access to and free flow of scientific and technical information (STI) are of great importance to all countries. A major objective of the United States in taking the initiative to establish the UNISIST program in the early 1970s was to help the developing world avoid becoming information "have-nots" during a period of rapidly evolving technology influencing information handling on a worldwide scale. Another objective was to be an active participant in discussions on information standards and on information network development.

There have been beneficial results from the UNISIST Program and some problems--it has not achieved all that had been hoped. Some of the problems stem from the fact that there has been diminished U.S. leadership and presence in the program. For some years, there has been no focal point in the federal government for considering policies,

coordinating programs, and dealing with international issues in the area of STI.

Serious attention should be given to examining the international aspects of STI policies, programs, and needs (including the work of UNESCO and other international bodies) with regard to U.S. national interests in this area. It is in the national interest to promote a stable period for international scientific communication during the decades ahead. To achieve this, an assessment or blueprint should be prepared, whether the United States withdraws from UNESCO or not, to clarify U.S. objectives and the appropriate role it should play in international STI. The Office of Science and Technology Policy (OSTP) or NSF might be called upon to convene a meeting where the interests of technical agencies and departments, as well as those of the private sector, could be assessed. The U.S. National Commission on Libraries and Information Science with the cooperation of nongovernmental organizations could also contribute to this process.

Alternatives

UNISIST is an important area of UNESCO's work that needs to be addressed in the context of overall international scientific and technological information programs and clarified U.S. objectives. Selected science information activities should be supported in the light of this assessment through funds administered by NSF and/or the U.S. National Commission on Libraries and Information Science.

Notes on Major Program VII:
Information Systems and Access to Knowledge
with respect to scientific and technological information activities

VII.1 Improvement of Access to Information: Modern Technologies, Standardization, and Interconnection of Information Systems

refers to work on:

- UNISIST Guide to Standards for Information Handling.
- UNISIST Reference Manuals for Machine-Readable Bibliographic Descriptions and for Description of Research Projects and Institutions.
- UNISIST normative texts and materials for improving the compatability and interconnection of UN information systems and services.
- Networks for the exchange of information and experience in science and technology, for example, in Asia and the Pacific (ASTINFO).

- Development of compatible information systems and the establishment of the Global Network on Scientific and Technological Information.

VII.2 Infrastructures, Policies, and Training Required for the Processing and Dissemination of Specialized Information

refers to work on:

- Promotion of national information policies and the multilanguage publication of the UNISIST quarterly newsletter.
- Development of information services for scientific and technical literature.
- Scientific and technological data services.
- Establishment of an information consolidation unit following recommendations of a UNISIST Working Group on Information Analysis and Consolidation.
- Consultant services for establishing scientific and technological information centers

VII.3 UNESCO Information and Documentation Systems and Services

refers to:

- The International Oceanographic Data Exchange (IODE).
- International information system relating to new and renewable energy sources.

All program areas refer to work on establishing information policies, the provision of information services, and training of information specialists.

V.2: Teaching of Science and Technology

Assessment/Potential Impacts

UNESCO has devoted considerable attention to the improvement of the teaching of science and technology, particularly at the secondary school level, over the past 25 years. The products of "in-school" work are of value to all countries although most of the efforts are directed toward the needs of developing countries. This program is administered in the Division of Science, Technical, and Vocational Education under the Assistant Director General for Education. It is a program concerned with the development of science and technology teaching materials (networks and documentation services, course content development, training workshops, technical advisory services) and their dissemination (extension courses, clubs and summer camps, out-of-school projects). The total program budget (staff and projects) plus overhead is about $5 million per year--the U.S. contribution is about $1.25 million. Considering only program costs ($3 million), the U.S. contribution is $750,000 per year. Support from "outside" sources totals about $2.4 million per year.

The improvement of secondary school science education through the development of course content materials and teacher training is important throughout the world. Initial work in this area at UNESCO, inspired by U.S. scientists, was carried forward by a particularly able staff unit, originally established within the science and technology component of the Secretariat. This responsibility has since shifted to the Education Directorate.

U.S. scientists and science educators have been actively involved in UNESCO-sponsored course content development projects and teacher training activities in many countries and regions. An impressive example of this participation is the Institute for the Promotion of Science and Technology Teaching in Thailand funded by UNDP and administered by UNESCO, where Americans have participated for over 10 years. Other examples of American involvement in this area are projects in the Middle East and in China.

Another important area of work of value to the United States is the support and encouragement given to establishing an information network on the teaching of science and technology in liaison with the International Bureau of Education. The activities of the affiliated International Clearinghouse on Science and Mathematics Development located at the University of Maryland are of national as well as worldwide importance.

With respect to the current UNESCO program, increased support should be provided to subprogram V.2.1, concerned with the Development of School Teaching of Science and Technology (the qualification of out-of-school in the UNESCO program title is inappropriate and should be deleted). The work on so-called out-of-school projects, V.2.2 is of questionable value.

Alternatives

It is proposed that resources at a level of $1.5 million per year be channeled to U.S. professional groups and universities operating international programs to reinforce selected UNESCO activities. These efforts should be managed by an appropriate body sensitive to U.S. interests such as the NSF and/or NRC.

V.2 Teaching of Science and Technology

	Biennial ($000)	Annual ($000)
Regular Program (1984-1985)	$6,070	$3,035
of which staff and indirect costs	4,127	2,064
of which project costs	1,943	971
Regular Program and overhead (64.3%)	9,973	4,987
Other sources	4,835	2,418

V.2.1 Development of School and Out-of-School Teaching of Science and Technology

V.2.1.1 Exchange of Information

$127,115

Network on teaching of S&T in liaison with International Bureau of Education; publication on innovations in five languages; documentation services; international symposium.

V.2.1.2 Experimental Activities

$106,250

Curricula research and evaluation; inquiry on place of S&T in curricula; improvement in curricula; 4 new pilot projects in experimental areas.

V.2.1.3 Course Content

$118,450

Content development in various disciplines and interdisciplinary curricula; publication of reference documents; seminars; preparation of materials; studies in math education; new trends in biology teaching; nutrition education.

V.2.1.4 Training Workshops

$136,250

Preparation of training materials; development of equipment; travel grants to developing countries; establishment of national training programs; regional cooperation for design and production of inexpensive lab and teaching equipment.

V.2.1.5 Technical Assistance

$64,900

Strengthening of national infrastructures; regional consultative committee in Africa.

V.2.2 Dissemination of Scientific and Technological Knowledge

V.2.2.1 Extension Courses
$82,100
Nutrition and health through media; preparation of teaching materials; technical documents and kits; preparation of international symposium; case studies.

V.2.2.2 Out-of-School Activities
$79,050
S&T programs for young in rural areas; clubs, summer camps, periodicals; preparation of teaching materials; source book on out-of-school activities; volume in studies in math education.

V.2.2.3 Training for Out-of-School Work
$121,450
Technical support for implementation of experimental training programs; workshops for out-of-school organizers; travel grants for study tours; symposium.

V.2.2.4 Technical Cooperation
$49,600
Technical assistance for strengthening national out-of-school programs; better public understanding of S&T.

TECHNICAL COOPERATION PROGRAMS

1. Participation of UNESCO in national programs: $86,450

2. UNDP: ($560,000)
   Afghanistan, Caribbean, China, Egpyt, Indonesia, Hungary

3. Islamic Development Bank: ($1,500,000)
   Lebanon

4. Funds-in-Trust: ($357,500)
   Nigeria (self-financed); Asia and Pacific financed by Japan; Caribbean financed by Arab Gulf Program

General Activities, Chapter 2: Statistics on Science and Technology

Assessment/Potential Impacts

UNESCO's efforts in the area of science and technology statistics are carried out in a central Office of Statistics under the Assistant Director General for Program Support. The large staff, working with statistical services of member countries, focuses on (1) collection, dissemination, and publication of statistical data; (2) support of international and regional conferences; (3) development of international standards, concepts, and definitions to improve comparability of data; and (4) training and improvement of statistical infrastructures. The total program budget (projects and staff) plus overhead of this activity is about $800,000 per year--the U.S. contribution is $200,000 per year. If one considers program costs only (about $500,000 per year), the U.S. contribution is $125,000.

The UNESCO Statistics on Science and Technology program has developed common concepts, definitions, and statistical methods for use by all UNESCO member countries in surveying the expenditures and manpower employed in R&D by the several sectors of their economies. The UNESCO definitions differ in some respects from those of the OECD Frascati Manual in order to make it possible for countries with free enterprise, socialist, and development economies to reply to the periodic questionnaire. (In the United States, the NSF organizes the replies to both the OECD and UNESCO inquiries.) Member countries forward their completed surveys--usually carried out by their respective central statistical bureaus--to UNESCO, which publishes the results in the UNESCO Statistical Yearbook. This UNESCO effort is the only one that provides more or less comparable data on the magnitude of employment and investment in R&D in a large number of countries beyond the OECD circle. The work has been carried on since its inception in the late 1960s by the Division of Statistics on Science and Technology of the UNESCO Office of Statistics, largely independently of any UNESCO activities in science policy formulation.

Developing and interpreting standards for statistical surveys of R&D investment is a highly technical activity, particularly when it spans many countries. It depends on continuing contact with statisticians in member countries and on periodic conferences to reinforce common concepts, consider problems of reporting and interpretation of data, and identify useful new directions, such as the proposed survey of member country outlays for science and technology information and documentation.

The data emerging from the periodic surveys are available for analysis those interested in the science and technology commitment of other countries and for experts concerned with intercountry differences in trends. U.S. nonmembership in UNESCO would limit the availability of U.S. expertise for this area.

Alternatives

This statistical work on science and technology is difficult, useful, and should be encouraged. The United States has played an important role in guiding these efforts including staff services on the Secretariat. A preferred interim alternative arrangement to enable continuing U.S. professional interactions would be the provision of $200,000 per year to the NSF to support advisory services to the UNESCO staff and member country statistical services. Another interim alternative would be the provision of this same level of resources to the OECD Science Technology Indicators Unit to provide such services to the UNESCO staff.

Statistics on UNESCO Science and Technology

Chapter 2, under General Activities, pertains to UNESCO work on Statistics. A portion of these efforts is concerned with Statistics on Science and Technology. The 1984-1985 approved program and budget include the following items:

I. Collection, Dissemination and Publication of Statistical Data and Improvement of Techniques for Processing Them
Annual Projects: $7,950
Experimental questionnaires on S&T information and life-long training.

II. Analyses and Studies and Support for International and Regional Conferences
Annual Projects: $3,300
Analytical studies, estimates of interregional disparities, indicators.

III. Improved Standardization and International Comparability of Data, and Advancement of Statistical Methods
Annual Projects: $14,600
Cooperation with other international bodies (ECE, OECD, CMEA, OAS); preparation of first international survey on S&T information and documentation; guides on survey methods.

IV. Training of Personnel and Improving Statistical Infrastructures
Annual Projects: $47,650
Two regional training seminars, pilot projects, consultative services.

Participation Program
Annual Projects (approx.): $12,000
Statistics on science and technology.

Total projects costs	$ 86,000 per year
Total staff costs, estimated	409,000 per year
Total annual program, estimated	$495,000 per year
Total program, plus overhead, estimated	$813,000 per year

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